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ABSTRACT

This document contains the following papers on electronic portfolios from the SITE (Society for Information Technology & Teacher Education) 2001 conference: (1) "Portfolios: The Plan, the Purpose, a Preview" (Val Christensen and others); (2) "Electronic Portfolios (EP): A How To Guide" (Jerry P. Galloway); (3) "Electronic Portfolios: A Glimpse into a Child's Education" (Claire Smith Hornung); (4) "Electronic Portfolios: Developed by Preservice Educators To Show Teaching Skills and Philosophies To Be Used by Future Employers" (Roger L. Olsen and David H. Dimond); (5) "Implementing Web-Based Electronic Assessment in a Graduate Instructional Technology Program" (Melissa E. Pierson and Michael Rapp); (6) "Electronic Portfolios: Technology Integration and the Preservice Teacher" (Beverly Ray and others); (7) "The Implementation and Integration of Web-Based Portfolios into the Proteach Program at the University of Florida" (Gail Ring); (8) "Easy Methods and Media for Creating Electronic CDROM Portfolios" (Desmond Rodney and others); (9) "Online Portfolios for Educational Technology Graduate Students: An Ongoing Capstone Project" (Jennifer L. V. Sparrow); (10) "The Impact of Electronic Portfolios on Early Experience Preservice Elementary Teachers in Integrating Technology into their Instructional Process" (Jane Strickland and others); (11) "Making the Case for Science Teacher Learning: An Analysis of Argument and Evidence in Electronic Portfolios" (Carla Zembal-Sual and Tom Dana); and (12) "A Pilot Project: Integrating Multimedia Portfolio Development into the Preservice Teacher Education at Randolph-Macon College" (Zizi Zhang). Most papers contain references. (MES)

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ELECTRONIC PORTFOLIOS

Section Editor:
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It is a pleasure and an honor to introduce a new section in the SITE2001 Annual. This is the first year we have had a strand devoted to electronic portfolios (EP) in teacher education, although a number of past editions have included excellent reports of their development and use. In the mid-90s I was involved in the development of the Teachers for Tomorrow Program at the University of Houston. Our interns collected, sorted, and organized materials, lesson plans, reflections, and other relics of their preservice days. From this they winnowed the best examples and developed a paper portfolio. A few photos, a video, and audio tape or two were the extent of 'multimedia' in their presentations. How exciting it is to read the current developments in portfolios and recognize how far we have come is such a short time.

As in all sections this year the papers are arranged alphabetically by first author; however I will introduce them in categories for the reader. The papers is this section may be placed in three groups: Overview and Development, Graduate Program Use, and Preservice Program Use.

Overview and Development

Begin your exploration of this section with an article *by Zembal-Saul, Dana, and Haefner,* Penn State University, USA. While the authors report a case study of preservice teacher use of EP, their research provides an excellent overview and foundation in the underlying value of EP use. It also emphasizes the reflection of growth that may be shown in this type of portfolio. Having established a foundation look next at the paper by *Galloway,* Indiana University Northwest, who describes specific issues and procedures for the development and maintenance of EP. Based on the guiding principle that virtually anything can be represented electronically the author provides suggestions for methods and formats, soft as well as hard.

The third article by *Rodney, Knee, and Musgrove,* Florida Atlantic University, USA, addresses many of the early technical issues encountered when building EPs and outlines a practical solution to creating EP using the CDROM. They note the methods make portability, replication and updating CDROM portfolios easier for students and educators alike. For a final paper in this subsection, read *Hornung,* Lehigh University, USA. This report forms an excellent parallel to the third article in that the author addresses the human issues. She provides ten guidelines for the collection, selection, reflection and presentation of a portfolio. Although initially designed for a preK-5 setting these guidelines are of equal value for teacher educators planning the implementation of electronic portfolio.

Graduate Program Use

Two papers in this section of the Annual are centered on the use of electronic portfolios in graduate teacher education. Interestingly, both are web-based. The first, *by Pierson and Rapp,* University of Houston, USA, reports use of EP in a Master's program where the students develop their portfolio throughout their master's work and then compose a summative "epilogue" as one part of their comprehensive exam. In the second article, *Sparrow,* Florida Gulf Coast University, USA, describes how students are required to create and maintain an online portfolio as an alternative to a traditional comprehensive examination. Their program is delivered in an online format, and students are located around the world. Portfolio assessment provides an attractive alternative to exams by offering an authentic assessment of student knowledge in the quickly changing world of educational technology.

Preservice Program Use

The remaining six papers look at the development and application of Electronic Portfolios in preservice teacher education. The first two articles describe how EPs are developed throughout the students' college education. *Christensen, Gegelman, Grooters, and Holcomb,* Valley City State University, USA; report on the EP structure and guidelines that are built around the adopted VCSU Abilities of aesthetic engagement, collaboration, effective citizenship, global awareness, problem solving, technology, and wellness. This university provides each and every student with a laptop computer and requires all graduating

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education majors to develop an electronic portfolio as a graduation requirement. In the second article, *Ring*, University of Florida, USA, reviews the development and implementation of the electronic portfolio. Each student's electronic portfolio is viewed as a dynamic, interactive document that is developed over the student's entire college experience and may continue to develop indefinitely.

The next article, by *Olsen and Dimond*, Brigham Young University, USA, reports on the initial portfolio development by two undergraduate cohort groups, formed at the beginning of their junior year and remaining together while they complete their methods courses and teaching practicum. All students in the cohort begin creation of their electronic portfolio as they come into the program as juniors and continue through student teaching.

The fourth paper, authored by *Strickland, Williams, Jenks, and Zimmerly*, Idaho State University, USA; describes the design of an IT course constructed around the portfolio process, and coordinated with a course of educational planning, delivery and assessment. The authors report the results the first two semesters of their research with the use of EP.

The authors of the fifth paper, *Ray, Wright, Stallworth, and Wilson, University of Alabama, USA*, report perhaps the most exciting and relatively unusual EP development team. The team consisted of secondary education language arts and social studies faculty, instructional technology faculty, and graduate students from both disciplines. Students were evaluated on their electronic portfolios that consisted of websites, digitally edited teaching episodes, databases, concept maps, and more.

The final paper from *Zhang*, Randolph-Macon College, USA; describes a pilot project designed to meet preservice teachers request for more opportunities to apply technology skills for teaching and professional use. Four volunteer preservice teachers use and will learn various instructional technology skills for the development of their multimedia portfolio.

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Portfolios: The Plan, The Purpose, A Preview

Val Christensen, Valley City State Univ., USA; Patricia Gegelman, Valley City State Univ., USA; Larry Grooters, Valley City State Univ., USA; Linda Holcomb, Valley City State Univ., USA

We live in a technology-enhanced world. As a leading Teacher Education program in the state of North Dakota, Valley City State University (VCSU at http://www.vcsu.nodak.edu) has taken on the initiative to promote technology and train teachers for this world. In February of 1996, faculty at VCSU began using IBM notebook computers. The university became the second campus-wide notebook university in the nation during the fall of 1997.

Valley City State University provides each and every student with a laptop computer. This access to technology was the impetus for encouraging students to produce an electronic portfolio. Recent university requirements state that all graduating education majors will produce an electronic portfolio as a graduation requirement. This portfolio showcases the skills and abilities adopted by the university. Presentation of portfolios is evaluated by small groups of faculty as an exit exam. The University's 2000-2002 Bulletin states:

"As pa.t of their graduation requirement at VCSU, all students must develop a digital portfolio that illustrates the intellectual and job-related abilities they have developed while studying at VCSU...Currently, students prepare their digital portfolios on CD-ROMs. The portfolio presents the best work each student has completed while studying at VCSU, work that illustrates the student's significant achievement of at least five of the eight VCSU Abilities. Some of these Abilities are major-specific, and some relate to the student's minor field, general education , or co-curricular activities."

Valley City State University faculty members have specified eight abilities that form the foundation of the student portfolio. These eight abilities are based on the Secretary's Commission on Achieving Necessary (SCAN) Skills research, but have been modified to meet the needs of this University. Each of the abilities also identifies specific skills that are required (See table below). During the spring of 2000, faculty members at VCSU developed a rubric to establish levels that must be met for each skill beginning in the general education courses and developing further in the courses for the students major. Progress is tracked at check-points by advisors and through completion of class projects.

UNIVERSITY ABILITIES	SKILLS
Aesthetic Engagement	• Receptivity • Visualization
Collaboration	• Positive Interdependence • Leadership
Communication	• Written • Spoken • Visual • Performance
Effective Citizenship	• Provides Service to Others • Change Agent Skills • Teaches Others
Global Awareness	• Works with Diversity • Understands System Interrelationships
Problem Solving	• Gathering Information • Creative Thinking • Systems Analysis • Problem Recognition • Decision Making
Technology	• Selects • Applies
Wellness	• Self-Management • Self-Worth

The Teacher Education Program Handbook lists twenty objectives designed to prepare entry-level teachers. Three objectives are included as examples of how the program matches to the university abilities.

The program is designed to prepare entry-level teachers who:

1. are competent in communication skills of listening, reading, writing, and speaking;
   ABILITIES MET: Collaboration, Communication, Problem Solving, Wellness

9. possess the knowledge of how to motivate students to want to learn,
   ABILITIES MET: Collaboration, Effective Citizenship, Problem Solving, Wellness

17. possess the knowledge and skills to be effective classroom managers,
    ABILITIES MET: Collaboration, Communication, Effective Citizenship, Global Awareness, Wellness

The elementary education department has mapped out projects that take place in each class that meet these skills and abilities and can be used in the student's electronic portfolio project. (See excerpt below.) Students then select projects for five of the eight abilities and demonstrate these in their senior electronic

portfolios. The reflection process plays a major role in demonstrating these abilities. In addition to the five abilities, all education majors must meet the three education abilities, which are based on the University's teacher education model. The theme of the model is "Teachers as knowledge-based decision makers". The abilities of Planning, Implementing and Evaluating are the focus of this theme.

Elementary Education Major

Mapping Plan for Abilities and Skills

The following includes courses, projects, abilities, and skills designed to assist students who major in Elementary Education. Students may choose any of the projects listed below to meet requirements for their portfolio. (Minimal portfolio requirements include one skill from each of the eight ability areas.) Students must also demonstrate the teaching abilities of planning, implementing, and evaluating. Demonstration of the teaching abilities can be completed in one teaching situation or in three different situations where the ability is demonstrated individually.

Course	***Project***	***Ability***	***Skill***
EDUC 320	Inquiry Project	Communication	Writing
EDUC 323	Resource File	Problem Solving	Creative Thinking
EDUC 430	Diagnostic Testing	Global Perspective	Understands Systems
EDUC 355	Science Lesson	Effective Citizenship	Teaches Others
EDUC 431	Title I Work	Wellness	Self Management
EDUC 200	Teaching a Lesson	Planning	
		Implementing	
		Evaluating	

This senior electronic portfolio is currently required for the exit exam in the teacher education program at VCSU. A one-credit senior electronic portfolio class is offered in each department during each semester to aid students in the development of their portfolio. (See sample syllabus.) These classes review the expected layout of the portfolio, the types of projects that can be used and some of the technical skills required, as well as the intended audience that they are developing the project for. In addition, a handbook for the senior electronic portfolio project has been developed which includes how-to steps and examples (http://www.vcsu.nodak.edu/offices/titleiii/portfolios.htm).

Portfolio Seminar Syllabus
EDUC 491

This class is designed to help you complete your required portfolio for graduation. Six two-hour class sessions are planned for Monday afternoons between 4 and 6 PM.

Session 1

- Discuss the relevance of the portfolio project as a capstone activity and importance to student
- View sample portfolios discussing their strong and weak points.
- Talk about resumes.

Assignment: Write Resume and scan picture into laptop.

Session 2

- Discuss the Departmental requirements of Abilities
- Construct Main Menu slide and link to resume. Decide background, color, etc.

Assignment: Create a portfolio file on laptop and start collecting projects and storing them in this file.

Session 3

- Discuss audience for portfolio (personal or employment)
- Discuss non-linear format of the portfolio.
- Create a storyboard of projects for the portfolio.
- Pair projects with appropriate abilities.

Assignment: Complete storyboard and continue creating portfolio in PowerPoint.

Session 4

- Discuss reflective statements and their importance to the portfolio.
- Make a stronger connection between projects and Abilities.
- Demonstrate creating audio and video for PowerPoint.

Assignment: Write reflective statements and insert into portfolio.

Session 5

- Portfolio should be near completion.
- Address needs of students to that they can finish

Assignment: Complete portfolio for viewing.

Session 6 (meet individually with instructor)

- Class views portfolio, offers input, and makes suggestions

Assignment: Perfect portfolio for exit evaluation prior to graduation.

At the end of the semester, a day is reserved for graduating seniors to present their portfolio to a small group of faculty members. The faculty members then accept or reject the finished electronic portfolio. This process is still evolving with much evaluation and feedback instigating new change. (See Assessment of a Digital Portfolio.)

Assessment of a Digital Portfolio

Portfolio Creator: _____

Evaluator's Name: _____ Date of Evaluation _____

Position: (Circle one) Self Group Peer Faculty Other

Direction for use of sheet
Mark the box above the appropriate level for each aspect assessed in the portfolio.
For scoring purposes the following numbers are applied: Unacceptable = 1, Developing = 2, Accomplished = 3, Exemplary = 4
If **Unacceptable** or **Developing** is marked, include a comment concerning improvements that need to be made.

Content Aspects	☐ Unacceptable	☐ Developing	☐ Satisfactory	☐ Exemplary
Demonstrates an understanding of Abilities & Skills ▪ Portfolio demonstrates student's understanding of the Abilities & Skills	▪ Portfolio is superficial in its approach and does not appropriately address the student's learning.	▪ Portfolio indicates a general understanding of the Abilities & Skills but needs more development.	▪ Most projects are well chosen and adequately demonstrate an understanding of the Abilities and Skills.	▪ The Portf clearly addresses of the Abilities a demonstrates a thorough underst of the Skills.

Comments on improvements needed:

	☐ Unacceptable	☐ Developing	☐ Satisfactory	☐ Exemplary
Grammatical Accuracy **The following are applied correctly:** ▪ Spelling ▪ Grammar ▪ Punctuation	▪ Portfolio contains many spelling errors or grammatically incorrect sentences. ▪ Written material lacks punctuation or is not correctly punctuated.	▪ Portfolio contains a few spelling errors or grammatically incorrect statements. ▪ Written material lacks some punctuation.	▪ The Portfolio contains none or very few spelling errors. ▪ Material is in most cases grammatically correct. ▪ Written material is punctuated correctly.	▪ The Portf has no spelling er grammatically in sentences. ▪ Sentences well constructed. ▪ Appropria punctuation is us all written materi

Comments on improvements needed:

	☐ Unacceptable	☐ Developing	☐ Satisfactory	☐ Exemplary
Informative & Reflective **In the Portfolio:** ▪ **Reflections are clearly stated.** ▪ **The material presented is pertinent.** ▪ **The Portfolio is appropriately focused for the audience**	▪ The Portfolio lacks clear reflection. It is not pertinent to the Abilities & Skills demonstrated. ▪ The student has not focused it for the audience.	▪ Portfolio demonstrates Abilities & Skills but they lack adequate reflection. ▪ The material may fit but could be more pertinent. It lacks clear focus	▪ Portfolio reflections are reasonably clear. Materials are pertinent to the Portfolio but may need to be more tightly affixed to the Abilities & Skills. ▪ The focus of the Portfolio seems appropriate for the audience.	▪ Portfolio reflections are cl well focused for t audience. ▪ All the m used are pertinen well applied to th Abilities & Skill

Comments on improvements needed:

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Technological Aspects	Unacceptable	Developing	Satisfactory	Exemplary
Multimedia Application **Appropriate use of:** • **Sound** • **Pictures** • **Video** • **Animation** • **Hypertext**	• Resources add little or nothing to the content. • Some resources are annoying with no aesthetic appeal.	• Resources do not add much content be do add minimal aesthetic appeal.	• Resources add to the content & contribute to aesthetic appeal.	• Resource contribute much content and add aesthetic appeal.

Comments on improvements needed:

	Unacceptable	Developing	Satisfactory	Exemplary
Organization & Interface Design • **The Portfolio is well organized.** • **The portfolio is easily navigated.** • **Transition through projects is appropriate.**	• The organization of the Portfolio is difficult to follow and the user is not given enough navigational structure to view the Portfolio. • Buttons are not clearly labeled.	• The Portfolio shows some weaknesses in organization and navigation is unclear in places. • It is easy to get lost and difficult to return to original screen.	• Materials are well organized. • Navigation is available but may be lacking in some areas. • Most buttons or hypertext is clearly labeled and easily located.	• The Portf shows strong, log organization. • Navigatio easily understood available where necessary. • Buttons hypertext is clear labeled.

Comments on improvements needed:

	Unacceptable	Developing	Satisfactory	Exemplary
Visual Design **Appropriate use of:** • **Colors** • **Backgrounds** • **Graphic's size, quality, & placement**	• Shows little understanding of visual design principles. * • Colors & backgrounds are inappropriately used. • Graphics are miss-sized or poorly placed. • Screens are unbalanced and difficult to understand.	• Shows some balance and harmony. Graphics and colors need to be improved. • Follows few visual design principles. *	• The format shows balance and harmony. • Appropriate colors are chosen and graphics are clean and easy to understand. • The Portfolio follows many visual design principles. *	• A visual Interesting to vie appropriate color and positioning graphics. The • Portfolio an understanding visual design pri *

Comments on improvements needed:

Projects appropriately reflect the Abilities required in the student's major.	Portfolio demonstrates the student has met the goals of the student's major at a level appropriate to a graduating senior.

Electronic Portfolios (EP): A "How To" Guide

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Abstract: This paper is provided to motivate and assist readers in establishing an electronic portfolio (EP) based on a guiding principle: Virtually anything can be represented electronically. This is not a step-by-step procedural or reference document as much as it is an explanation of important technical issues in the development of an EP. The value of an EP is discussed and compared to traditional formats, including helpful information for constructing and maintaining a professional portfolio in an electronic, technology-based format.

Introduction

Considering today's trends toward competencies over courses, as teachers must document and demonstrate those competencies, a portfolio is becoming almost more important than a transcript. As we evolve toward portfolios, so too must teachers adapt to a computerized environment - thus, electronic portfolios (herein called EP).

Virtually every pre and inservice teacher should have an EP. Warner and Maureen (1999) suggest that by developing an EP, teachers will learn important computing skills and knowledge that can directly impact integration into the classroom. But, it is believed that, frequently, a lack of understanding or knowledge of computing prompts teachers to compromise or settle for something less than ideal technological achievement. And, without reliable or sound leadership from advisors and faculty, inexperienced teachers are likely to weaken or undermine their goal of an electronic portfolio. Many faculty advisors in higher education are still not technology users and will likely fail to motivate and lead, let alone actually guide teachers to create an EP.

This paper is therefore provided to motivate and assist readers in establishing their EP (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 1997; Dampier Australia Primary School, 2000). This is not a step-by-step procedural or reference document as much as it is an explanation of important issues in the development of an EP.

What Value Is An EP?

It is a mistake to ignore the value and usefulness of an EP. A common phenomenon among most users of technology, benefits are discovered as a result of being users of technology that may not be initially obvious. Kind of a "being in the right place at the right time" notion. For those who already maintain a technological lifestyle it may be that an EP is a natural extension of their daily life and may be easily established. However, most teachers are not yet that involved and may need more awareness of the benefits provided by an EP.

Its useful to compare with non-electronic formats. Papers, documents, class assignments, tests, instructional materials, etc., can all be packaged in a variety of traditional ways. For example, common methods include ring-binders, folders, even boxes for storing large quantities of papers. Photographs are sometimes placed in photo albums or their original envelopes from developing labs. Video tapes, usually VHS format, are also included in storage boxes often large enough to hold all of these kinds of materials. So, with such a large collection of bulk, regardless of the convenience of binders and plastic containers and convenience products of all sorts, consider the following comparisons with this more traditional approach:

(a) Distribution. Consider applying for a job in another city, or providing one's portfolio to various agencies or organizations. Without the use of UPS, Federal Express or DHL, how does one quickly distribute such bulk to the interested parties? Too, with only one "original," once delivered it may be permanently gone. Retrieving the materials can be as difficult as giving them out. This may seem overly dramatized for portfolios made up of little more than a single ring binder. Not so. Although, possibly less significant, the problem is the same. A zip disk or CD-ROM containing a complete EP can be easily reproduced and quickly distributed as often as desired without any

need for retrieval at all. Even easier would be a Web-based EP that can be provided to interested parties as quickly as a word over the phone or a simple email message over any distance.

(b) Quantity/Economy. There is always some cost involved in reproduction of anything. Computer media has diminished in cost considerably. At the time of this writing, zip disks are under $10, blank CDRs are around a $1 each, all without buying in large quantities. Any comparison with photocopying paper portfolios shows the economy and practicality of an EP. A Web site is in many cases completely free. In some cases, where a base fee is required, expansion and addition to the site costs nothing extra. None of these factors are true for traditional formats.

(c) Replication. It's much easier to make multiple copies for distribution. Both zip and CD media will hold large amounts of information of all types and they can be easily replicated. Computer files can be copied as easily as drag & drop. CD's are even easier to recreate once a CD "image" is created and saved. A new CD of a complete EP can be created with as little as two or three clicks. On the other hand, a Web page doesn't require any replication at all and is readily accessible to the whole world.

(d) Size. This is the most obvious advantage. The amount of material that can be placed on a zip disk or CD is equivalent to many binders or boxes and yet takes up virtually no space at all. Today, it is literally possible to walk around with a complete library in your pocket.

(e) Security. A computer file is far from secure. Any computer file can be easily lost either through oversight and error to more technical media failure. But, combined with the ease and economy of replication, backup copies can be easily created and stored in different places. The permanence and security of an EP is in the numbers. By producing a sufficient number of backup and storage copies, quickly and easily done, an EP can be maintained securely forever.

(f) Maintenance. Most electronic material can be easily modified. Certainly, any records can be updated with new material but some records are considered permanent. Generally, electronic computerized material is more easily modified and maintained. Of course, a video or sound clip, aside from minor editing and enhancements, is naturally limited to the original sampling. Quality can sometimes be modified whereas content is permanent. Nevertheless, the simple matter of copying, organizing, modifying and storing electronic material far exceeds the efficacy and utility of traditional hard materials.

(g) Versatility. Electronic media is obviously more versatile than traditional hard materials. That is, a ring binder of material is much more difficult to convert to an electronic format than to produce a hard copy from an electronic version. Even to directly replicate a set of hardcopy materials into additional hardcopies (photo copying) is still more difficult and costly than producing a hard copy from an electronic original. I.e., having an EP means you have both whereas having only a hardcopy version limits one, because of obvious practicalities, to only the one original.

(h) Quality. Certainly not the least concern is the higher quality provided by modern computerized formats. Research has shown that even hand-written material is evaluated higher than typed material – but neither is considered as professional or high quality as computer-generated products. Video, sound and photo material, even when transferred to hardcopy, has improved to rival original/traditional formats.

Electronic Documentation

A guiding principle is suggested. Virtually anything can be represented electronically. It must be assumed that a given entry can be represented in electronic form – even if not originally created in that form – so one addresses how to achieve proper form and structure rather than to resist or deny the objective. I.e., it is important to pursue a complete portfolio, with virtually any desired component included, in a form that would, for example, fit entirely on a CD-ROM. Note that even a fully posted Web site can usually fit on a single CD.

How to begin? An electronic portfolio can be very difficult to generate from scratch to accommodate previously stored material, documents, events and historical notes or products. It is very important to start early and generate portfolio artifacts in an electronic format from the beginning and to continue that processes throughout all subsequent work. While every student should have an EP, it is up to the individuals to do it themselves so the

student or teacher must take the initiative, invest the time and do the work. Working one step at a time, generate and/or store the materials yourself. Specific strategies are suggested in Figure 1.

1. Virtually every single experience or product can exist and should be documented electronically.
2. Identify specific artifacts that denote accomplishments for each and every standard.
3. Produce the appropriate abstract or summary of each artifact when its identified as a portfolio entry.
4. Gather or develop electronic artifacts EA. when you first complete the project - don't procrastinate.
5. Distinguish between a developing portfolio DP. – work in progress – and the final or professional EP.
6. Organize a developing portfolio DP. according to the standards or principles of your program.
7. Store all electronic artifacts EA together with backups safely stored in completely separate location.
8. Frequently review the organization of your EP - every 2-3 months, or whatever is manageable.
9. Regularly review and update file formats for each EA to stay compatible with developing software.
10. Regularly review and update the media used for storage to stay technologically current.

Figure 1: Electronic portfolio (EP) development and maintenance strategies.

There are obviously more common sense notions about caring for computerized material but these 10 guiding principles will help facilitate transformation into an electronic lifestyle. Some of the implications and details for these strategies are discussed in a more concrete fashion below.

Details

An EP can be very difficult to create from scratch. It is very important to start early and generate portfolio artifacts in an electronic format immediately and to continue that processes thereafter. While every teacher should have an EP, only the teacher can do it. Take the initiative and, one step at a time, generate the materials needed. Start now and do the work for each potential artifact as they're created or as they occur.

EP Formats

Your final EP can exist in various media formats and will likely need to change formats from time to time. One reason is to stay current (see Strategy #9, Figure 1) and the other would be to provide material to a target audience in the format they need. Consider the following:

Floppy Diskette holds only very little (1.44 megabytes). This is not practical as a storage medium. In many instances, floppy drives are no longer included on today's machines. Too, many single graphic files and certainly sound and video files are much larger than a floppy's full capacity. Still, for smaller files, floppy diskettes are still useful for transferring and moving information.

Zip disk holds a lot of information in one of two common formats: 100 or 250 megabytes. It is conceivable that some EPs could contain more than 100mb. For example, in the case of numerous video or sound files. It would not be likely for mere print media (word processed files) to fill this much space. In any event, two 100mb zip disks could be used and information arranged in a fashion to make it user-friendly – for example, placing all print media on one and audio/video on the second.

Jaz disk wow, holds a great deal of information (1 gigabyte) but is not likely to be widely available. It is not practical to send a EP to an administrator or program director (maybe when applying for a job) if they do not have a compatible device.

CD-ROM Virtually all computers today (some older may not) have the ability to at least read a CD-ROM. Acquiring access to a CD-"burner" for creating permanently Recordable (CD-R) or ReWritable (CD-RW) CDs is becoming more common. A CD-ROM at 650 megabytes would hold all

material for virtually any EP. The price is right. The size is right. The compatibility is right. Goldilocks would be happy.

Video Tape — Traditional VHS tapes (analog video material) are still thought by many today to constitute a technological presence. That is, some believe that having portfolio material included on video tape (classroom teaching, presentations, etc.) constitutes having one's portfolio in a technological format. Even the newer digital formats (digital-8mm), while higher quality, still constitutes a non-computerized media and therefore has inherent limitations: hard to distribute, costly to reproduce, awkward to access. While such recordings are a natural part of recording events, such material should be viewed as raw data from which presentable excerpts are distilled – ultimately, digitized into computerized presentations.

There are other media available today including so-called super diskettes, portable/removable hard disks, and even "thumb"-drives. However, these items above are still the most commonly available media among average professionals.

A Beginning: Easy Stuff

The most obvious material that is EA ready would be any word processed document. It's already electronic. Certainly, the instructor may have required a paper version but keep the electronic version as well and transfer it quickly to your DP. That is, take each word processed artifact and copy it to your portfolio storage area (organized by the standards or principles to be demonstrated). This storage area or working portfolio is developmental (DP) would likely be modified regularly.

Create a word processed Table of Contents file (start one today) in which each EA is listed by file name. It should also show all related files together and where on the disk (or other media) the file(s) can be found (path). Not only is this of obvious use to other readers, after several semesters you too will be glad to have this guide. The format or style of this can be easily modified later but at least there will be a working DP and that's the most important thing.

Anything in Electronic Format? – Really!

Often students fail to realize that virtually anything can be represented electronically. Of course, it would be a big mistake to hand write your term paper and hire someone to type it on a typewriter leaving you no electronic format at all. But, even this can be scanned and stored on disk as an image file. The point is anything can be represented electronically.

OCR = *Optical Character Recognition* ... means that scanning a document can recreate the material in a character-by-character format as if it was originally typed into a word processor. However, unless you are very, very proficient at using this type of software, it can be quite difficult and somewhat impractical. Scanning the document is fine but it will likely remain in a "picture" format.

Consider the following examples.

Example 1

Consider a possible worst-case example. Students in a mathematics class learn to cut and fold paper to produce dice then to be used to practice and reinforce mathematics concepts of probability and statistics. Even this can be included in your EP (even on a CD). A simple photograph or two of the materials, manipulatives, maybe including a student using the materials, could be scanned and stored electronically. The EA would include the electronic picture and maybe a word processed anecdote or announcement describing its design and use (like an extended caption for the photograph) and any data from pilot testing or suggestions for using the activity and manipulatives. In other words, anything can be represented electronically.

Example 2

You're teaching in a classroom and recording on videotape to document strategies, a lesson plan, classroom management or other issues. Often, videotape is considered a major part of an EP but its problems are described above. Videotape cassettes should become peripheral components of a portfolio that exist separately and in some other location. If your final EP is to be on CD then how can this format accommodate (and represent electronically) the video material from the videotape? A representative sample portion, 2-3 minute segment(s), could be digitized into a computer file playable by most video computer software and thereby included in the EP.

One format would be AVI format (audio/visual integration) and is very common. Today, a more condensed format that saves a great deal of space without sacrificing quality is MPEG formats. To do this, video-capture hardware and software are required and are usually add-on components to a traditional computer setup. Pure sound files would be WAV or the more compressed MP3 (mpeg) formats. Again, the point is clearly that virtually anything can be computerized – and should be if its to become part of the EP.

Filenames

Filenames can be an important factor in managing your system as quick and efficient file recognition can be important. Various products associated together should share similar filenames, including the summary or reflective abstract. For improved organization, name the abstract file similar to the artifact file(s). For example, if the artifact has a filename such as "Lesson Plan.Doc" then name the supporting abstract something like "Lesson Plan AB.Doc" Or, if the artifact has a filename like "Teaching Video.AVI" with a written summary named "Teaching Vid Sumry.Doc" then name the supporting abstract something like "Teaching Vid ABS.Doc" That way, sorting displays will keep the files close together in a list. Too, the reader can easily associate the files that go together and can find abstracts of other EA because the same style is used throughout the EP. For more information on filenames, see the section below on versatility.

Folders

While many arrangements can suffice, it is suggested that a series of folders be created which correspond to the standards or conceptual framework of the program. For example, the Indiana University Northwest, School of Education has a 9 part conceptual framework for its undergraduate program (Indiana University Northwest, 2000) and a 5 part framework for its graduate program. Maybe name specific folders for each standard or program areas and place EA within each of these folders. Of course, material could be further organized within those folders based on the nature of the EA itself. It might be advisable to describe the assessment/evaluation context and maybe include any associated evaluation rubrics. In any event, structuring your EA according to the standards or framework of your program may be important to convincingly support your achievements and competencies.

Good Habits

It is not acceptable to simply put each semester's data disk in a shoebox with all those of previous classes. There are a million ways to fail in developing your EP and none of them are technological. They are all a matter of organization, habits, commitment and procrastination. The files themselves must be copied to the storage area of your developing portfolio (DP). Ultimately, it doesn't matter if this is a zip disk or a hard disk folder so long as it is maintained and developed. Always have one central location for the DP - not a home computer for some things while other files are kept on your laptop computer.

All - repeat - ALL disks fail. If "Murphy's Law" ever had a home its in the world of technology. Don't wait for it to fail - save it early! Don't wait to lose it - back it up! Don't wait for it to disappear - keep a copy! DON'T PROCRASTINATE - REPLICATE!

Versatility

As technology changes in the future, any file may need to be readable by someone with slightly different technology. Most state-of-the-art word processors are cross-platform (works on PC's and Macs both) and will likely be available for years to come. While this author suggests Microsoft Office tools (word processor, database, spreadsheet, etc.) as the most versatile and reliable cross-platform software tools, many Word Perfect users might suggest Corel products. In any event, maintain files in a versatile and latest-version format. As new software products evolve from old, stored files in the DP may need to be updated or converted. Do not hesitate. This is part of the regular and frequent maintenance discussed above.

Sometimes files need to be in multiple formats. The filenames themselves denote specific file formats. For example, "Letter.Wpd" - the W.P.D. indicates that it is likely a Corel Word Perfect word processed data file. There are many ways to convert one file type into an alternative format - like changing a BMP file into a JPG file (both are graphics files). Figure 2 provides a list of very common file formats and the typical filename extension associated with that file type (of course there are many, many more). Remember, file formats can usually be converted from one to another with minimal loss of appearance or function. Some skills are involved but help resources are available on campus, on the Internet and more.

FILE.PDF - Acrobat Reader File – Widely compatible, printable, searchable – Read only
FILE.DOC - Microsoft - WORD word processed data file
FILE.WPD - Corel Word Perfect word processed data file
FILE.RTF - Rich Text File - Generic word processed file - some formatting
FILE.TXT - Plain Text File - Generic data (text only) - NO formatting
FILE.XLS - Microsoft - Spread Sheet data file
FILE.MDB - Microsoft - Database data file
FILE.WK4 - Lotus 123 - Spread Sheet data file
FILE.BMP - Bitmapped Graphics file
FILE.JPG - Graphics file - suitable for pictures on the Internet
FILE.GIF - Graphics file - suitable for clip art on the Internet
FILE.PICT - Graphics file - typically a Macintosh file format
FILE.TIF - Graphics file…
FILE.EPS - Graphics file…
FILE.PPT - Microsoft - Power Point Presentation file
FILE.STK - HyperStudio Stack - file
FILE.HTM or .HTML - Web Page file for Netscape or Int. Explorer
FILE.MOV - Movie file - QuickTime Video can include Sound
FILE.AVI - Movie file - Video can include Sound
FILE.MPG - Movie file – Mpeg - video & sound – high quality, small file … Best
FILE.WAV - Sound File - Various levels of quality & wide compatibility
FILE.MP3 - Sound File - extremely reduced file size with good quality … Best

Figure 2: Filename extensions as indicators of file types.

Miscellaneous Notions

Material throughout the EP can be hyper-linked together (easy in MsWord) and to the table of contents to make viewing everything more convenient and efficient.

Use a digital camera to take pictures of products, events, situations and more that should be in the EP. You can also use any regular camera and then ask when developing that your photos be produced and returned on a disk or CD (already in electronic format). Or take the paper photos and scan them into a computer to be saved on disk.

For any "computer" tasks you're not able to perform yourself, help is available at campus computer services, from professors and friends and even your local Kinko's.

Other material beyond the EA that support program standards might not be prescribed by other portfolio outlines. Nevertheless, such peripheral and ancillary material can also be stored electronically and may even be included in the final EP (space permitting) under a head of "other."

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Electronic Portfolios:
A Glimpse into a Child's Education

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Abstract: Electronic portfolios use the purposeful collection of students' work, progress and the achievements of the paper portfolio and puts them together using technology that enhances and expands the delivery of the portfolio. A collection of multi-media work is far easier to present electronically than to find the perfect container to hold a students artifacts from preK-5. Electronic portfolios can include graphics, video, and sound, in addition to all that is included in a paper portfolio. There is no limit to these portfolios. Its creation is guided by the imagination of the creator. Similar to the paper portfolio, students can take a lead role in using technology to develop their own electronic portfolios. The Moravian Project involves incorporating electronic portfolios as an assessment tool for students and teachers alike.

Introduction

Approximately ten years ago, educational portfolios were introduced into academia. Teachers would collect student work. Sometimes the student would take an active role in this selection of work. The collection of student work models that of an artist and the artwork they completed. Artists use these portfolios when interviewing for jobs or pursuing advanced degrees in art. Students with an academic portfolio might use a portfolio for the same purpose. These portfolios would show a selected audience information that can provide far different insights into a students performance than a letter of reference or a report card. Therefore, as this movement worked its way further into classrooms, so too did the idea of using a portfolio, over time, for student assessment.

Portfolio assessment is the purposeful collection of student work that includes efforts, progress, and achievement to document growth over time and focus on the processes involved with learning (Weldin & Tymarkin 1999). While there might be as many different variations of portfolios as there are learners, most fall into three main categories: the celebration portfolio, the growth or project portfolio and the status report portfolio (Stiggins, 1997). All three types of portfolio have merit and benefit both teachers and students. However, the target audience for each of these types of portfolios vary and the type of portfolio selected to be used should be kept in mind by the creator.

Electronic portfolios use the purposeful collection of students' work, progress and the achievements of the paper portfolio and puts them together using technology that enhances and expands the delivery of the portfolio. A collection of multi-media work is far easier to present electronically than to find the perfect container to hold a students artifacts from preK-5. Indeed, electronic portfolios can include graphics, video, and sound, in addition to all that is included in a paper portfolio. There is no limit to these portfolios. Its creation is guided by the imagination of the creator. Similar to the paper portfolio, students can often take a lead role in using technology to develop their own electronic portfolios.

A Project at Moravian Academy

The Lower School teachers at Moravian Academy (preK-5) have been encouraged for the past 7 years to collect student work to create paper portfolios. These portfolios travel with the children through to the fifth grade. However, not all teachers followed through on selecting artifacts and sending them on to the next grade teacher. At present, portfolios were paper-based, not electronic.

The goal of this project is to establish guidelines so teachers and students will know what to select from each student and that each portfolio collected will follow the same criteria. Students will also take part in

reflection and assessing their own work. In addition to establishing the guidelines for the teachers at each grade level, the project focused on implementing electronic portfolios as the next logical step to incorporate the enhanced technology that the school had to offer its teachers and students. The impact of this project would change the entire focus of these paper portfolios. Teachers will invite students to take part in the selection of pieces for their portfolio. This participation will allow them to reflect on why they choose these pieces. Therefore, the students will have far more ownership over their learning. Personal ownership over learning is key to the learner and is a key goal for our project.

Guidelines for Portfolio Implementation at Moravian Academy

The Pennsylvania Department of Education developed guidelines that can be used in portfolio implementation. In his text on student-centered assessment, Stiggins (1997) presented several guidelines to keep in mind when developing a portfolio. His list of "active ingredients" describes successful ways to incorporate a portfolio for student assessment and achievement. When the guidelines for Moravian Academy were developed several suggestions from both the Pennsylvania Department of Education's and from Stiggins' research were considered and fit into our criteria of *Collection, Selection, Reflection and Presentation*:

1. Maintain a sharp focus on what is the purpose and the target of the portfolio. Think big. Start small.
2. Rely on quality assessments as the foundation for quality work.
3. Plan in advance what the portfolio will tell by setting guidelines for what is placed in a portfolio.
4. Plan in advance how it is that a portfolio will be used within an existing curriculum.
5. Insure that administrators, teachers, students and parents have ownership over the project in some way and are supportive from the beginning.
6. Establish specific criteria for the assessment.
7. Share the entire process of implementation with the students: collection, selection, reflection **and** presentation.
8. Involve students in the process of selection.
9. Involve students in the process of reflection.
10. Setup a time line with due dates for works to be included (be flexible with this timeline).

At present funding is sought for the implementation of this project. A pilot study was conducted with one classroom and general guidelines were followed. This portfolio was then used by the student for self-assessment and by the teacher during parent-teach conferences. Teachers at Moravian Academy will work with education students from Lehigh University to implement the guidelines of the project. The students from Lehigh will work with each team of three Moravian teachers in grades preK-5 to implement student portfolios for each child. The Lehigh student will be responsible for training the teachers in the creation and maintenance of electronic portfolios, using the template and guidelines established from the pilot project. These students will also serve as resources and trouble shooter if problems should arise.

Conclusion

While an electronic portfolio or even a paper portfolio may be described and supported, through research, as a strong and viable academic tool, not all educators will have the desire or the need to adopt this tool. Understandably, it takes time, effort, and additional energy to develop school or classroom guidelines to integrate portfolios. Yet, many of our schools fail our students because of a lack of appropriate and proper assessment of individuals. Many students are not successful with standardized tests. Others perform better after reflecting on their own work and the strengths that go with their own learning styles. Portfolio assessment developed with strong guidelines allows for the strong test taker and the reflective learner to find success in their accomplishments. This success can provide educators and parents, alike, with an insightful and, perhaps, enlightening glimpse into a child's education.

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Electronic Portfolios: Developed by Preservice Educators to Show Teaching Skills and Philosophies to be Used by Future Employers

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Abstract: This paper is a report on the work that has been done by two undergraduate cohorts in the David O. McKay School of Education. Approximately thirty students are formed into a cohort at the beginning of their junior year and remain together while they complete their methods courses and teaching practicum. All students in the cohort begin creation of their electronic portfolio as they come into the program. Electronic portfolios have been created and analyzed for the purpose of helping preservice teachers formulate and articulate their beliefs regarding the education of elementary students, and to collect evidence of planning, management, teaching strategies, and assessment that would be in harmony with those beliefs. This departure from traditional paper portfolios utilizes video clips of studentsÕ teaching, other visuals, written plans, and assessment to show their teaching abilities.

Introduction

As teachers of the ÒPlanning, Management, Teaching Strategies, and AssessmentÓ course for elementary education majors at Brigham Young University, we were asked to explore ways technology might be integrated into the course. The course is part of the cohort experience which goes throughout the studentsÕ junior year while they are also taking other methods courses and completing their teaching practicum.

Strengths and weaknesses of the course were analyzed. In so doing, the question arose as to the real value of one of the assignments: student paper portfolios which were created to promote reflection, and as a means of presenting to prospective employers an idea of the strengths and beliefs of the student. In surveying students who had previously completed the course, almost all reported that employers showed no interest in looking at their portfolios. Principals frequently commented to the instructors that they looked like a voluminous looseleaf of papers that would require too much time to gather pertinent information about the studentÕs teaching.

It was decided that electronic portfolios might offer a better alternative for students to showcase their teaching skills. The use of concise, personal philosophical statements which would show their beliefs in the various aspects of teaching, coupled with still images, audio, and video clips, seemed to be a more authentic and interesting means of communication, as opposed to the traditional paper portfolios.

The Project

The prospect of electronic portfolios was discussed with the students, and for the first semester it was decided to give students the option of doing either an electronic portfolio or the traditional paper portfolio. Even though students were assured that their choice would not make a difference in their grades, all thirty students chose to utilize the electronic format.

Categories for demonstrating teaching skills were discussed, and eight categories were decided upon with the flexibility given to students to change, add, or delete areas based on their need and preference. The

eight categories were: Effective Teaching; The Learner; Parent and Community; Diversity; Personal and Professional Development; Assessment; Classroom Management; and Curriculum. (The first semester, most students chose to use the suggested categories; many students in the second semester cohort chose other categories to better reflect their individuality.)

The evolution of the project has been dramatic. During the first semester, many major difficulties were encountered, which included: the instructorsÕ ability to use the technology; the availability of the necessary hardware and software; sufficient time for instructors to assist students with video transfer and compression; and students who lacked the technological skills to independently accomplish the project.

During the first semester, the computers and software required for video capture and compressing were only available in a graduate lab, which was inaccessible to our undergraduate students. Thus much of the teachersÕ time was taken up with compressing files and burning CDs so the students could import those files into their presentations. During the second semester, there was no change in the availability of hardware and software (with the exception of the purchase of two digital video cameras and a digital still camera); however, planning and organizing differently improved the efficiency of the projectÕs implementation.

Results

Feedback on the value of electronic portfolios was sought from six principals in the public schools where students were placed, along with colleagues and administrators from the David O. McKay School of Education. Most of the principals were excited about the possibility of the video portion of electronic portfolios, which they believed would allow them to get a better feel for the studentÕs personality and ability to relate to students. The principals preferred a CD as the medium to view the portfolios. Only one principal said he would not be interested in seeing an electronic portfolio, but stated the reason was that he did not have the necessary computer skills to view the portfolio. However, he felt that knowing the students had the skills to create an electronic portfolio would increase his interest in hiring them.

Feedback from staff and administration in the School of Education was, for the most part, positive. Suggestions for improvement were offered. The criticism most often heard was the lack of evidence of student reflection. As one student shared his electronic portfolio with his instructors and an administrator he stated that, ÔThe most valuable thing that came out of this was not doing the portfolio itself, but what I learned about myself and my teaching beliefs.Õ However, that reflection was not evident in his portfolio. Since then, personal discussions with other students have revealed they also shared the same sentiment as the student just mentioned. Based on the feedback, as future students are assigned electronic portfolios, reflections on their teaching will be included.

Future Project

B.Y.U has received a PT3 Federal Technology Grant which will provide much needed help for the expansion of this project. However, some of the greatest support has come from the administration in the David O. McKay School of Education. Upon our request, the following kinds of support are being given: (1) two digital video cameras were provided for student use; (2) a still digital camera was purchased; (3) multiple workstations for our undergraduate students are at the moment being set up, including necessary computers, compression software, video capture software, video editing software, CD burners, and Zip drives; (4) necessary technological skills will be taught to our cohort by the Instructional & Psychology Technology instructor. The administration has also offered to provide the needed assistance required by our students in the computer lab.

It is projected that creation of electronic portfolios will be done by all students in the College of Education at Brigham Young University.

Implementing Web-Based Portfolio Assessment in a Graduate Instructional Technology Program

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Abstract: Web-based portfolios are a solution to presenting learning in our Masters program because they allow students to play a key role in directing their own learning, to demonstrate creative design, and to conveniently access work on any platform. Students store learning artifacts on a department server, and confidentiality is guaranteed through a Web-based form that automatically enables password protection. New students take a required course to learn about technical procedures related to maintaining the portfolio, as well as strategies for selecting portfolio items and for composing personal reflections on their work. Students review and reflect on their own learning during each course so that they will have a clear timeline of their own learning. As students' understandings mature, they create connections among discrete learning artifacts, designing various interfaces to customize the presentation for multiple audiences. During their final semester, students review the entire portfolio to select items that demonstrate achievement of program objectives and write reflections to accompany each item. Students will compose a summative "epilogue" as one part of their comprehensive exam. Despite some anticipated challenges, initial informal feedback from students is positive, so we remain committed to further developing our portfolio assessment process.

The appeal of performance portfolios continues to grow as a form of assessment for authentic activities in Pre-Kindergarten to higher education settings. We have previously described our ongoing investigation of Web-based portfolio assessment as a requirement for students in our graduate Instructional Technology (IT) program (Pierson & Kumari, 2000). Our initial plans for a portfolio strategy in our IT program began with a series of goals: What should a student graduating from our IT program know and be able to do? What kinds of evidence will verify that the information and skills have been learned, and how would we be convinced that goals have been met? What hardware, software, and networking will support successful portfolios, and how will they be compiled? And, in general, how effective is our program at preparing future instructional technologists? These questions are aligned with successfully implemented portfolios discussed by others (Barton & Collins, 1993; McLellan, 1993; Niguidula, 1997).

The new portfolio assessment process has now been implemented in our Masters program, and already practice has both confirmed some of our plans and caused us to reconsider other strategies. We have framed our current understanding of the process with Barrett's (2000) stages of electronic portfolio development: Defining the Portfolio Context and Goals, The Working Portfolio, The Reflective Portfolio, The Connected Portfolio, and The Presentation Portfolio.

Defining the Context and Goals

Purpose and Benefits

We began by defining why we felt Web-based portfolios were a solution to presenting our students' learning. A distinct advantage of portfolios is the student ownership of learning. We have recently redesigned our program with clear performance objectives that students will meet upon graduation, and it was important for us that students play a key role in directing their own route toward demonstrating proficiency with the objectives. Electronic portfolios are an ideal collection and presentation format since the artifacts of learning in our program are almost entirely digital products, and the Web-based format holds particular promise as it allows students to demonstrate creativity in presentation and organization (Watkins, 1996), permits flexible access from anywhere by the student, faculty, fellow students, and potential employers, and eliminates issues of software incompatibilities on multiple platforms (Mills, 1997). We anticipate that portfolios compiled throughout a graduate program will make the connections among discrete courses explicit, eliminating the prevalent perception that course products are produced in isolation merely to receive a grade. Finally, we look forward to the ongoing feedback on the effectiveness of our program that portfolios will provide our faculty. Such feedback, we believe, can directly feed continuous improvement and development of the program.

Structure and Storage

Electronic storage options are numerous, however we felt the Web the most promising primary storage format due to its flexibility, accessibility, and compatibility. Upon acceptance into the program, each student is given permanent disk-space on a department server to be used for the duration of his or her studies. Students are the managers of their own portfolios, however a consistent hierarchy of file organization based on our course numbering system is encouraged throughout the program to ensure orderly storage and easy faculty access to assignments. The Web environment gives students the option to store learning products in the most appropriate format, including word processing, electronic presentation, HTML, multimedia, and even PDF.

To encourage honest reflection on their own learning, students are guaranteed that their reflections will be kept confidential. Therefore, designing a plan for secure storage of student work was a priority from the beginning of our planning. Students voiced early concern as they participated in the planning process that the Web environment would leave their work artifacts and written articulations open to the public. They worried that their original ideas could fall into competitors' hands, or that potential employers could stumble onto incomplete forms of work in progress, possibly giving false impressions of their abilities and jeopardizing future career options.

Restricting access to sensitive or personal material in the portfolios presents a unique challenge in system administration. The portfolio files are housed on a Linux server, which can be very daunting and cryptic for users not familiar with UNIX-based command-line interfaces. Rather than make such file manipulation a requirement for all students from the beginning of their programs, we chose instead to make the technology as invisible as possible. Enabling password protection normally involves creating encrypted password files and Hypertext Access Restriction files for the various directories. The account administrator developed a Web-based form that allows students to easily enter their Linux login name, password, and desired Web password along with the password protection options they wish. Most students create a "portfolio" directory within which they place individual course directories. It is this main portfolio directory that is generally protected, thus simultaneously protecting all files beneath that level. A ColdFusion backend engine translates the users' requests into commands understood by the Linux operating system which in turn sets up all of the appropriate files, permissions, and encryption data automatically. An added feature of our system allows faculty access to student assignments without having to keep tack of every individual password. Each faculty member's unique IP address is added to the access restriction files so that the server automatically recognizes the computer and grants access to the files without prompting for a password. These storage and security options continue to be refined as we think through creative solutions to new challenges. Our goal is to keep requirements as consistent as possible so that students will not have to spend time reworking portfolio structure in place of focusing on other coursework.

Required Introductory Course

The compilation and evaluation of performance portfolios is something most of our graduate students have not personally encountered, so to ensure a smooth transition to quality work selection and collection, we have restructured our Masters course offerings to include a beginning required course called "The IT Professional." Along with teaching basic technical skills necessary for success in the rest of our courses and assimilating our students into our program as a cohort group, this course serves the vital purpose of introducing the portfolio concepts and procedures. Students receive instruction on technical considerations related to maintaining the Web-based portfolio, such as organizational guidelines, file transfer procedures, and procedures for storing learning reflections. Students establish the focus of their portfolios by writing individual goal statements, exploring strategies for selecting portfolio items to represent a range of work quality and type, and learning to compose personal reflections on their work.

The Working Portfolio

Once the portfolios are established during the first semester in our Master's program, students collect and store learning products in accordance with course objectives in subsequent courses. As all course objectives have been written with reference to the overall IT program objectives, the portfolios likewise remain aligned. All faculty are moving toward explicitly stated requirements in the form of rubrics, often developed collaboratively with students. The use of rubrics focuses student attention on course expectations from the beginning so that they will be better able to frame their own learning and progress in relation to the course.

We recognize the need in the final portfolio product for a balance between student-selected items chosen to show personal learning and those items suggested by the faculty to demonstrate learning in accordance with program goals (Snyder, Lippincott, & Bower, 1998). For this reason, students will be encouraged to save everything created in relation to each course so that they will have a variety of items from which to select when chronicling their learning at the end of their programs.

The Reflective Portfolio

Our IT portfolios will be useful only if they transcend merely pleasing displays of completed work to instead make compelling arguments of a student's knowledge and skill. All courses require students to review their own learning progress, either for each assignment or at end of each semester, and to write a reflective essay describing their understanding of their learning at that time.

During the initial semester of this reflection writing, many of our students have struggled with this process. Few have been asked to think purposefully about their own learning prior to this course, and they have questions about what to include, how deeply to comment, and how detailed to write. In the required IT Professional course, we discuss components of reflection, and contrast exemplary and weak reflection examples. As instructors, we hesitate to give students the detailed prescriptions they desired, such as specifically how long reflections should be and what the finished products should look like. We have compromised by coming to a common, yet flexible, reflection structure:

1) **Identification**: what course objective the reflection refers to
2) **Context**: for what purpose the item was created (i.e., created specifically for this course requirement or created for a professional purpose and modified for the course)
3) **Procedures**: the steps that the student followed to create the product
4) **Evaluation**: how the student perceives the quality of the product, including strengths and weakness
5) **Goals**: any plans the student has for continued learning in this area.

In addition, following the first semester of the course, representative examples of reflections for each of the objectives will be available for future students to refer to as models. We frequently encourage originality in format, and have seen students take advantage of the opportunity to display their unique skills. While some reflections rely effectively on text alone, others incorporate screen captures of other work documents, images, and audio. We hope

to progress in our own understanding of what constitutes acceptable demonstration of competency as students continue to stretch the limits of the standard course assignments.

Reflections written during each individual course retain students' immediate thoughts and concerns, so that at the end of the Masters program, students will not be required to guess at their thoughts months, and sometimes years, previously. Reflections are written so that students will have a clear timeline of their own learning, and are viewed only by the course instructor for the purpose of better understanding the student's progress and needs. In essence, each student is developing an individual theory of instructional technology as it relates to his or her own understanding.

The Connected Portfolio

By compiling the portfolios in a Web-based environment, students are able to not only store information and products, but to use the hyperlink capability to organize the presentation in such a way that demonstrates their unique understanding of their own learning. Students are charged throughout the process to be the managers of their own learning, and as their understandings mature, these connections among discrete learning artifacts can be flexibly reconfigured. Once basic Web-editing skills are gained through experience in the program, students can easily design a number of different front-end interfaces that will customize the presentation of their work for multiple audiences. Faculty may be guided through the portfolio in one way for, for example, and future employers may initially see something very different in look and organization. Considered along with the selected items and written commentary, the electronic interface and the navigational sequence serve as the ultimate demonstration of creative design and systematic development expected of IT graduates. The Web as both a technology and an interface enables the student ultimate control in portfolio creation and management.

The Presentation Portfolio

During their final semester in the program, students will be asked to review their entire portfolio, including the reflections written in each course, to select those items that they feel demonstrate their achievement of the IT program objectives. They will write reflective captions to accompany each item to rationalize the inclusion of the item in the presentation portfolio and to include personal reflections about attaining their learning goals. These captions will provide a unique comparative thread among skills and projects, enabling faculty or other audiences to evaluate learning products with the assistance of a student's "voice." Final portfolios will be stored in an accessible and portable format, such as CD-ROM.

It is our hope that the portfolios will ultimately highlight the interrelations among instructional theory, research, and practice evidenced in the products of learning and, furthermore, enhance the ability of each student to articulate these ideas. Such individual examination of learning evidence and subsequent reflection is not typical in our existing traditional written comprehensive exam format (Bali, Wright, & Foster, 1997; Barton & Collins, 1993), and we envision a time in the near future when portfolio assessment might replace the written comprehensive exam as a graduation requirement. This assessment would better reflect the constructivist teaching and learning philosophy and project-based nature of our program. As a trial of the effectiveness of student reflection on their own learning as a measure of achievement, students will be required to compose a summative "epilogue" as one part of their comprehensive exam to address specifically posed questions about their portfolio intended to synthesize understanding of theory and practice. Successful completion of the portfolio will conclude with the final step of a portfolio consultation with faculty advisors.

The Portfolio Process to Date

Masters students who began our program in Fall 2000 with this new portfolio requirement are presently completing their degrees, so we recognize that challenges will continue to arise. We have assessed portfolio components in individual courses, but have not yet reviewed entire portfolios; grading consistency and additional time commitments with this alternative assessment procedure may still pose problems. Initial informal feedback from students is positive, however, so we remain committed to further developing and strengthening our portfolio assessment process.

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Electronic Portfolios: Technology Integration and the Preservice Teacher

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Abstract: With the implementation of national standards addressing technology, teacher preparation programs are faced with the issues of preparing teachers to effectively use and to seamlessly integrate technology across content areas. A team teaching approach at the University of Alabama required its secondary methods students to produce electronic portfolios during spring 2000. The teaching team consisted of secondary education language arts and social studies faculty, instructional technology faculty, and graduate students from both disciplines. This effort of modeling technological best practices resulted from numerous team meetings, intensive planning, and consistent project evaluation.

Introduction

The secondary education methods courses at the University of Alabama have traditionally incorporated technology on a limited basis. However, as the result of a team teaching approach, and in answer to technology integration needs the preservice teachers were required to attend technology seminars as part of regular classroom and methods work. Students were evaluated on their electronic portfolios that consisted of websites, digitally edited teaching episodes, databases, concept maps, and more. Through pretest and posttest surveys, the students were assessed on their perceptions of an electronic portfolio's value and their ideas of how technology can enhance teaching and learning in

future classrooms. This session presents a discussion of the results from these assessments, procedural details, and the challenges and successes experienced by the teaching team and the students. Examples of student produced portfolios were presented along with ideas for developing a similar project in a variety of educational settings.

As educational technology standards are implemented, it becomes increasingly important for teacher preparation programs to model and to use technology. This presentation shares research from the trials and successes of how a teaching team and preservice teachers created electronic portfolios to increase use and applications of technology in the classroom.

Literature Review

Lankes (1998) defines electronic portfolios as a "purposeful collection of student work that exhibits the student's efforts, progress and achievements" (p. 18). Electronic portfolios differ from traditional portfolios in that information is collected, saved, and stored in an electronic format (Barrett, 1998). Electronic portfolios allow students to demonstrate problem-solving and critical thinking skills using authentic and performance based assessment (Campbell, Cignetti, Melenyzer, Nettles, & Wyman, 1997, Meyer, 1992). While more research is required to assess the effectiveness of electronic portfolios with pre-service teachers, existing research suggests that there are benefits to be gained from use with pre-service teachers (Herman & Morrell, 1999).

Numerous advantages related to the use of electronic portfolios are suggested by the literature. Bull, Montgomery, Overton, and Kimball (1999) write that electronic portfolios promote learner self-evaluation even as they maximize the use of diverse learning strategies. Barrett (1997) agrees with this assertion adding that electronic portfolios allow students to demonstrate problem-solving skills even as they are compelled to take responsibility for their learning. Campbell, Cignetti, Melnyer, Nettles, and Wyman (1997) argue that out of this learner responsibility comes a degree of control over the learning process and over the process of becoming a professional educator. The work of Herman and Morrell (1999) support this assertion as well. Throughout the process students are actively involved in their own assessment (Cole, Ryan, Kick, & Mathies, 2000).

The effective use of the medium requires ongoing evaluation (Barrett, 1998; Cole, Ryan, Kick, & Mathies, 2000), both on the part of the instructor and of the student. Cole, Ryan, Kick, & Mathies (2000) conclude that the central advantage of all portfolios, not just electronic, is that the instructor is able to assess the student's process of learning. Evaluation, requiring teamwork, creative thinking, and reflection (Bull, Montgomery, Overton, & Kimball, 1999), goes beyond the limits of the traditional classroom. Herman and Morrell (1999) argue that electronic portfolios shift the balance from teacher-centered learning to student-centered learning. Multiple sources of evaluation combined with self-evaluation encourage pre-service teachers to recognize and address individual strengths and weakness (Corbett-Prez & Dorman, 1999; Herman & Morrell, 1999). Herman & Morrell (1999) are convinced that electronic portfolios encourage students to

"review their individual teaching values and frame the issues that they feel are vital to the learning process."

Barrett (1998) and Lankes (1998) maintain that electronic portfolios are an attractive method of alternative student-assessment. However, issues relating to this electronic format must be addressed before requiring students to engage in this type of assessment (Corbett-Prez & Dorman, 1999). Research suggests that the implementation of an electronic portfolio project requires considerable investment of time and effort on the part of the instructor and the student (Linn & Baker, 1992; Cole, Ryan, Kick, & Mathies, 2000).

Findings

The team teaching approach assisted in the overall success of the electronic portfolio integration project and has continued to be a model at the institution of this study. The evaluation process was important and has helped to enhance the accessibility of and support in using the technologies for teaching and learning. Efforts have continued and since technology is ever changing, the evaluation process of how to effectively use technology as tools for teaching and learning must continue. To that end, our teaching team remains committed to reflective planning for, using, and evaluating technology in instruction. As our efforts grow to include more faculty, in-service teachers, and pre-service teachers in other content areas, we are excited about the possibilities and understand the challenges. Our focus remains good pedagogy; therefore, our technology efforts will continue to be research-based, reflective, and appropriate across the various content areas.

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The implementation and Integration of Web-based Portfolios into the Proteach Program at the University of Florida

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Abstract: This paper describes the development and implementation of the electronic portfolio program in the College of Education at the University of Florida. Beginning in the fall of 2000 all students entering the Proteach Program were required to develop electronic portfolios. Prior to this initiative an elaborate infrastructure was designed to support both the students and faculty involved with this innovation. Each student's electronic portfolio is viewed as a dynamic, interactive document that is developed over the student's entire college experience and may continue to develop indefinitely. It will contain illustrations of how the student has met Florida's Accomplished Practices, the student's professional goals and achievements, biographical information, and a personal teaching philosophy. Methods of developing electronic (online) portfolios are shared, ways of integrating these portfolios into practice are discussed, and an illustration of sample contents is reviewed.

Background

Preparing teachers for the 21st century has been a concern for both political and educational leaders in this country for the past two decades (Dede, 1995, Papert, 1999). This problem is compounded by the fact that "today a very substantial proportion of people are engaged in work, in jobs that did not exist when they were born and that number is increasing (Papert, 1999). NCATE has challenged higher education to incorporate technology across the entire teacher education program, not just as a "computer literacy" class added to the existing curriculum (NCATE report as quoted in Piper & Eskridge, 2000). In addition, the National Council of Teacher Accreditation (NCATE) requires its accredited schools of education to provide adequate access to computers and other technologies, and expects faculty and students to be able to use it [technology] (Major Themes of NCATE Standards, 2000).

In the past, professors were held accountable for what students learned. If parents or accreditation organizations wanted to know what students were learning, they asked the professor for a list of course objectives or an outline of the curriculum. Florida's Department of Education began measuring mastery of the state's accomplished practice standards by examining samples of students' work. Students' work is also the focus of assessment procedures used by many private funding agencies.

Because student work is to become part of the evaluation of our institution, we decided to develop an infrastructure for the development, storage, and presentation of student documents. In our model, each student will create, manipulate, refine, and collect evidence of his or her academic accomplishments. We intend to emphasize this procedure throughout the entire program of study.

In the literature, the word *portfolio* is usually accompanied by the word *assessment*. In our view, the descriptor "assessment" severely limits the potential of an electronic portfolio, and creates a perspective on the portfolio building process which undermines its distinctiveness and perhaps much of its value. Portfolios should help "learners become integral and conscious participants in the learning process" (Courts & McInerney, 1993). We feel that the role of the learner in the learning process is central to the development of electronic portfolios. If we are to use portfolios effectively in our preservice teacher program we must view portfolios as learning tools, rather than as end products. The portfolio itself has powerful pedagogical import and should have the "potential to inform learning" (Krause, 1996).

Purpose

Our students' electronic portfolios will contain proof of their proficiency on a set of Florida Accomplished Practices. These portfolios will then serve multiple purposes: students' self assessment and reflection about their learning, student maintenance collection and selection of the contents of the portfolio (maintenance), and the evaluation of our institutional performance in educating preservice teachers. Each student's portfolio will serve as an interactive document which will become the focus of an on-going reflection process. Students will be making decisions continuously about how to best represent themselves to their instructors, their peers, and their potential employers.

Rather than viewing the portfolio as a product or a container for holding students' work, we view it as an organic, evolving document which informs learning. While summative electronic portfolios can include (a) a representative sample of a student's work, (b) proof of accomplishment of accepted practices, (c) illustrations of outstanding achievement, (d) information about a student's goals and aspirations, (e) personal statements, and (f) a personal vitae and other documents relevant to future employment or academic development, formative portfolios offer a working environment for revision and reflection. Formative portfolios might contain works in progress, sample layouts, collaborative work including the work of others, and reference documents under consideration. For this reason, we believe that electronically stored portfolios should have public sections and secure, private developmental sections.

Structure

Although we want to support and encourage student decision making, it is important for those who must access student portfolios to be able to find specific information quickly and easily. Therefore, the index or home page for each student should be relatively uniform. Figure 1 contains an example of a sample student portfolio:

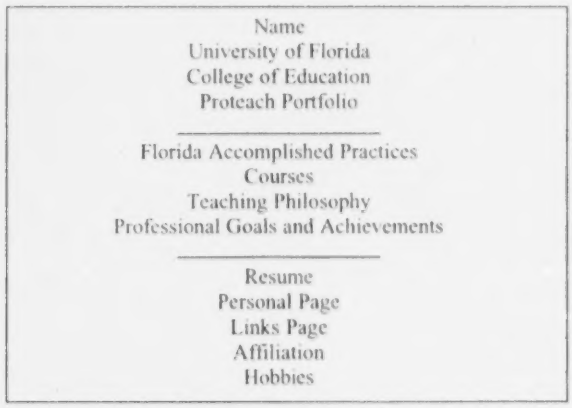

Figure1: Sample Student Portfolio

Each category links to a page or pages developed by the student. Although the *format* of the index page is clearly defined, content development should remain flexible and student centered. Portfolios are very personal. Student creativity and reflection are important consequences of the portfolio development process. Portfolios not only encourage students to make decisions, they encourage students to reflect on their work. As Krause (1996) states, "Portfolios allow numerous opportunities for the learner to think flexibly and nonlinearly about how and to what degree learning and change over time have occurred." We have discovered that when planning portfolio implementation, there is always a great deal of discussion about student reflection. However, as the process becomes formalized, the portfolio specifications become

more rigid and inflexible. We believe that preserving room for reflection should be a high priority when institutionalizing the use of portfolios.

Support

When the possibilities for acceptable completion of an assignment are widened to include more information channels--for example video, sound, or graphics--support for the student is essential. By building an infrastructure that attends to students' needs while simultaneously informing the learner, we hope to empower students to express themselves in more ways than text alone. In our model, the instructor of each course provides examples of how the course integrates with standards and/or curricular goals, as well as multiple ways in which this may be accomplished.

Next, instructional design students and/or student assistants analyzed the illustrations of acceptable work provided by the instructors and online support systems were developed. These support systems contain information sheets, tutorials related to the specific skills, descriptions of the accomplished practices or other standards, external links to pertinent references, video clips showing examples, a list of frequently asked questions, misconceptions, typical sample problems, and other helpful information. In addition, brown-bag seminars, workshops, and question-and-answer sessions, as well as one on one meetings with both faculty and students are held to provide additional support for specific endeavors. The goal of the support infrastructure is two fold: to help students improve their performance without making decisions for them, and to attend to the needs and concerns of faculty without adding additional work.

Using portfolios as a forum to demonstrate the accomplishment of given practices transfers a great deal of responsibility to the students. Decisions on how to best demonstrate their competence, such as which information channels to use (video, audio, photographs, text-based anecdotes, etc.) should remain with the students. Portfolio development increases the number of decisions students have to make about specific assignments, goals, and/or tasks.

Conclusion

Portfolios may be used effectively to model 21st century uses of technology to preservice teachers. As we watched our students create portfolios, we noticed collaboration and the sharing of ideas among students. As students began to reflect on their work and their learning experiences, they began to discuss ideas with their peers. Soon a healthy competition developed and their work clearly evolved. Many of them incorporated more advanced web development techniques and spent a considerable amount of time doing so. We are also happy to report that students have begun to drive this initiative. Faculty interest and participation has increased due to their exposure to student portfolios, and collaboration across colleges has occurred because of student suggestions.

We continue to have many questions about portfolio development. As our formal implementation plans are developed, we will attempt to determine how portfolios contribute to student learning. We will try to learn how to support a higher level of student reflection, an increased sense of ownership in our students' knowledge development, and an increase in students' self-esteem. We believe that by managing the vast amount of information in their portfolios, by deciding how to build a public representation of their accomplishments and of who they are, and by trying to integrate the various components of their public and personal histories, our students will develop skills and perspectives that will serve them well in the future.

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Easy methods and media for creating electronic CDROM portfolios

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Abstract: This paper seeks to outline a practical solution to creating electronic portfolios using the CDROM, which has traditionally been expensive and inaccessible in educational environments (Barrett: 1994). CDROM portfolios allow for easy updating and are a physical, sophisticated example of student work. They allow for storing large files and data types of students' work. The process of creating CDROM portfolios was at one point complex and difficult to learn and to teach. In this article, the authors outline methods that are in effect easy to learn and to teach. The authors have found that all errors are reduced when the artifacts for the portfolio are organized for presentation, mastered as an ISO 9660 or CD image and the image is then burnt to the CDR.

Electronic portfolios have undoubtedly become a critical component of authentic assessment methodology in education today (Barrett, 1999). E-portfolios as we have come to know them, have become popular among educators in all environments from k-12 to higher Ed. Aschermann, (1999) argues that e-portfolios are " a tangible collection of a student's best work". This perception has made e-portfolios very popular among educators and students. The portfolio provides both teachers and students with examples of what a student can do rather than merely relying upon a transcript of grades or formal evaluation forms.

Today both at the k-12 level and in higher-ed environments, e-portfolios are largely replacing notebook or ring binder portfolios (Lankes, 1995). The media to which we store e-portfolios however are not standardized. Traditional portfolios consisted of three ring binders or notebooks with printed copies of documents (artifacts) organized into specific categories. The content would differ from student to student but the media was largely paper-based. This meant that viewing or authoring a traditional portfolio relied on traditional methods such as word processing, printouts and the reading of documents from the binder. This portfolio required no special software to read or view its pages and was portable by just walking the portfolio from one person to the next.

This paper seeks to outline a practical solution to creating electronic portfolios using the CDROM, which has traditionally been expensive and inaccessible in educational environments (Barrett: 1994). The process of creating CDROM portfolios was also complex and difficult to learn and to teach. The methods outlined here are in effect easy to learn and to teach. Importantly too, the methods make portability, replication and updating CDROM portfolios easier for students and educators alike.

Electronic portfolios offer an important point of departure from traditional portfolios. Through their reliance upon the use of multimedia technology, teachers and students are allowed the flexibility of storing artifacts in different media types (Barrett, 1999). Most e-portfolios today are created with one or a number of

types of software applications. These applications are of two types, generic software packages that can be employed for the purposes of creating electronic portfolios and commercial packages designed for creating electronic portfolios (Barrett, 1999).

The most popular type of e-portfolio is the Hypertext or HTML based portfolio. This is largely because the HTML portfolio is often published to the World Wide Web, where students can view it and share it with other recipients. In this environment, an e-portfolio becomes a showcase of skill, ability and work quality. Compared to traditional paper-based portfolios, web-based e-portfolios, for students and teachers alike, become a tangible expression of high quality work and skill. Carefully organized graphic and multimedia features and interface elements can reinforce website structure, and ease the user's cognitive load (Cafolla & Knee, 1997).

HTML web-based portfolios offer ease of editing and updating because students can often update their webs from home or from the school's computer lab. The declining cost of software has helped this portfolio-publishing environment because many HTML editors are free and some come standard on most personal computers today. Importantly too, HTML based portfolios are convenient because all that they require for viewing is a standard web browser, which today is free and is also standard on most personal computers. Students can also produce the projects they create and learn valuable multimedia creation as well. All this can be done for a very small investment of funds, (Knee, Musgrove & Musgrove, 2000). Despite the convenience, ease and flexibility of HTML portfolios, there remain a number of disadvantages when they are published to the Internet. Many school and home environments lack Internet connections that are necessary to view web-based portfolios. Classrooms that are housed in portables for example, often do not have access to the Internet, it means that publishing or viewing of web-based portfolios in this environment is not possible.

Security and protection of student work is perhaps that greatest detraction away from web-based e-portfolios. Banner ad content on free web services is often inappropriate in the k-12 environment. Furthermore, students' work is in no way protected. Pages on free webspace providers often contradict acceptable use policies of school districts where linking to external servers is disallowed. Additionally, viewing many websites that are published on free services are blocked by proxy servers and firewalls on the school's Intranet.

A more convenient way to publish HTML based portfolios is on a *Compact Disk - Read Only Memory* (CDROM). Traditionally some educators have avoided authoring CDROM portfolios with their students because of expenses and problems that have been associated with them (Aschermann 1999: Jackson 1997). Jackson (1997) has discussed the limitations of creating e-portfolios on CDROM, these problems included how many copies of the CD to create, how would the CD be updated outside of the school environment, how would the CD be kept compatible across all computing platforms and where would students and schools find the expensive equipment needed to master CDROMS.

CDROM Portfolios

The CDROM presents an important element in electronic portfolio creation for a number of reasons. In one sense, there is the practical reason and the other is the cognitive interactions which CDROM portfolios engender. Practically, CDROM portfolios: Are lightweight and small; are portable – can be viewed where no Internet connection is present; allow for easy updating; are physical, sophisticated example of student work; allow for quick and easy organization, indexing and searching. Additionally, CDROM portfolios are not easily limited by external factors such as the deficit of an Internet connection, slow modems, or slow network connections they allow student work to be protected and their privacy maintained. Furthermore, they allow for expansion over time and grade levels; they allow for storing large files and data types of students work.

On the cognitive plane authors such as Fischer, (as cited in Chappell and Schermerhorn, 1999) has noted that the move from a paper based to hypertext portfolios (on CDROM or on the web) affect student thought processes. They confer that hypertext encourages "multifarious ways of thinking" in juxtaposition to linear thought processes involved in creating paper-based ring binder portfolios. In this context, therefore electronic portfolios allow students to: engage in more interactive problem solving skills; engage in deeper logic order and sequential thinking; engage in project planning and implementation; engage in applying cognitive theories of thinking and learning.

One important advantage of CDROM portfolios is their size. Most CDROM disks have a 700MB capacity the equivalent of nearly 500 high-density floppy disks or 300,000 typed pages; it therefore means that students can store a large amount of data on a CDROM disk. Web published portfolios however are often restricted by server space due to high volume use.

Problems with creating CDROM portfolios

CDROM portfolios have however been criticized for a number of reasons. Some educators have argued against CDROM portfolios because of the cost of the hardware and software tools that are needed for the creation of CDROM portfolios (Barrett 1994). However from the authors' perspective at this point in time the cost of CDROM Drives and CDR/CDRW media disks have been significantly lowered. This occurrence has provided the opportunity for educational institutions to acquire these tools at a more reasonable cost. Furthermore, CDRW drives have become standard on most personal computers for sale in the open market. It therefore behooves us as educators to tap into the proliferation of these devices by having our students learn effective ways to use them in accomplishing their learning goals.

Others have argued that electronic CDROM portfolios do not allow for easy updating compared to web-based portfolios. We argue however that the methods that we have employed to create CDROM portfolios in fact lend themselves to easy updating and easy learning for students and teachers alike. Another criticism of CDROM portfolios is that they are not portable across different personal computing platforms because of incompatible disk formats.

CDRW Drives • Internal - 10X Recording (CD-R), 4X Recording (CD-RW), 32X Reading (Max.), $272 • External - 6x read, 4x write, and 4x re-write external; $268
CDR Disks • Pack of 10 $17.00
CDRW Disks • Pack of 10 $48.00
Software Costs • Adaptec Easy CD Creator v4.02 $79.99 • CDEveryWhere (Shareware limited to 50MB image) $39.99

Table 1: Cost of CDRW drives and Media as of November 1999.

For example, the disk format of a Macintosh pc is different from that of a Windows based pc, where CDROMs are concerned neither platform will read the other's disk. Although there is a point at which this is a legitimate criticism, the process we propose allows for the creation of a portfolio that can be viewed in the Macintosh, or Windows format.

Hardware considerations

Within a few years CDROM drives have moved from a luxurious accessory to an inexpensive necessity on personal computers. Today Compact Disk Rewriteable (CD-RW) drives are now standard on most windows PCs. CDRW disks and CD-Recordable (CD-R) disks are easily available in most stores (for cost estimate see table 1). In an educational context CD-R media is preferable because of their low cost. It however means that there needs to be a CDROM creation process that is error free, or at least where errors are kept at a minimum. The process we will outline will eliminate, or at least offset many of the technical problems associated with creating CDROM portfolios.

Software Considerations

The most critical component of CDROM creation is appropriate software. As educators we are interested in software that is intuitive, easy to learn and easy to share with our students in restrictive periods of time. In the world of CDROM creation there are two basic types of software, the proprietary kind that ships with the CDROM burner from the manufacturer and retail software that can be purchased, separately from the device. We suggest purchasing Adaptec's Easy CD Creator deluxe 4. Portions of this software often ships with some CDROM burners; these versions will also work for our purposes. The retail version sells in stores or on Adaptec's website for $79.00.

In CDROM creation software conflicts are usually responsible for a large number of errors. Software manufacturers usually advise that only the CDROM creation software run at each burn. This can sometimes be inconvenient. We have found too that badly fragmented Harddrives, anti virus software and other software applications also cause the CD creation process to often result in errors. The process that we are outlining below can be accomplished even when other applications are running on your computer.

Creating a universal portfolio – the process

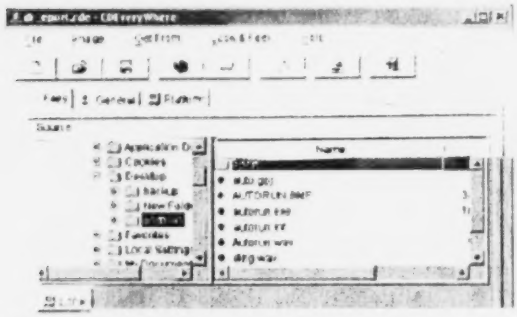
In creating CDROM portfolios the authors have found that all errors are reduced when the artifacts for the portfolio are organized for presentation, mastered as an ISO 9660 or CD image and the image is then burnt to the CDR media. The ISO 9660 file system is a standard CD Rom system authorized by the International Standards Organization (ISO), that allows you to read the same CD-ROM whether you are on a PC, Mac, or other major computer platform. Almost all computers with CD-ROM drives can read files from an ISO 9660 file system (Apple Development Connection 1998).

Making a CD IMAGE

Creating a CD image or ISO 9660 reduces error considerably. Also this approach allows for faster creation of a CDROM portfolio since burning the image to disk is faster than organizing, assembling and burning the files through the CDR software. To make a cd image we use a demo version of CDEveryWhere. CDEveryWhere allows the creation of a CDROM image that is portable across the popular pc computing platforms i.e. Macintosh, Windows and Linux. The program can be downloaded from (http://www.cdeverywhere.com). The version that we use allows for the creation of an image that is 50MB in size the paid version costs $39.95 and allows for a full CD image of 700 MB to be created.

Using CDEveryWhere

After the opening splash screen and the end user license agreement (EULA), the demo version of CDEveryWhere v.1 asks the user to agree to register, if you select register later the opening screen appears.
To create an ISO9660 image you must first select the files. Under the source window navigate to the disk that has the portfolio artifacts that have been organized. In our case it is the folder called portfolio that has been selected.



The contents of the folder are exposed here in the Name window

Figure 1: You can navigate to your gathered artifacts in the source window of CDEveryWhere's interface.

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The contents of the portfolio folder are then dragged from the Name window into the all platforms tab below. Please note that if All Platforms is not selected the CDROM will only work on the platform that is selected. We can now create the ISO 9660 or CD image by clicking on the Create CD image file icon as indicated below.

A dialog box asking for a save location appears.
Select a save location
Give the image a name.
Select Create

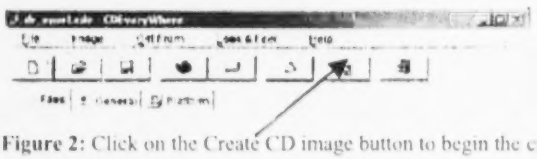

Figure 2: Click on the Create CD image button to begin the creation process.

The program then goes through the process of creating the image. A green checkmark indicates the completion of each step in the process. A red arrow indicates that the program is still completing a step.
When the process is complete, all steps have a green checkmark.
You then select the Close button.
When this step is complete the CDROM image is ready to be burnt to a CDRW or Recordable.

Using Adaptec Easy CD Creator. To burn the image to CDROM simply place a cdr or cdrw into your CD Burner.
Open Adaptec Easy CD Creator
The opening screen appears

Figure 3: The opening screen of Easy CD Creator.

From the file menu choose Create CD from CD Image. The following dialog box appears. Browse to the CD

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image that was created. Make sure that the Files of type dialog box is set to ISO image files.
Select Open
The CD Creation Setup dialog box appears.
Leave the settings as they are:
Click on the OK button
The CD Creation Process dialog box appears:
The program then goes through the steps of burning the CD image to the Recordable disk.
When the steps are complete, the Recording Phase indicator goes to 100% and a successful completion message appears. Students could go ahead and end the process by Clicking on the OK button.

Updating the CDROM

A CDROM created in this fashion is easily corrected and updated. The process is simply to edit the artifact of choice, recreate the CD image and then burn the corrected CD image to a new cdr disk. Educators are encouraged to use CDROM based electronic portfolios because they ensure that students' work will be protected and the privacy of students are safeguarded. In the school, environment CDROM portfolios discourage students from the desire to view external content, some of which may be deemed inappropriate by the school's authorities.

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Online Portfolios for Educational Technology Graduate Students: An Ongoing Capstone Project

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Abstract: This paper describes online portfolios employed as an alternative to comprehensive final exams for a distance-learning M.Ed./M.A. program at Florida Gulf Coast University. The paper addresses the issues that contributed to the creation of online portfolios. The benefits of portfolio assessment are compared to traditional comprehensive exams. The paper discusses why online portfolios were an attractive option for distance learning students. Additional information is given to demonstrate the development and implementation of online portfolios at Florida Gulf Coast University. The paper describes the computer resources available to distance learning students. The benefits and drawbacks of online portfolios are examined.

Introduction

Florida Gulf Coast University, founded in 1991, is the tenth institution in the Florida State University System. The approximate enrollment is 2,700 with a faculty and staff of 500. The campus is located in Southwest Florida on 760 acres of land. The mission statement of the University encourages the use of distance learning, and the University's Strategic Plan states that FGCU will develop 25% of its enrollment using distance learning.

The Master's Degree in Curriculum and Instruction, with a concentration in Educational Technology, is offered entirely online through the College of Education. Students enrolled in the distance-learning program are located around the world. Travel to FGCU is not required and often cost prohibitive for many students. Due to the distinctive nature of the program, faculty and students examined alternatives to the oral or written comprehensive exam traditionally administered at the culmination of graduate work.

Portfolio assessment was an attractive alternative for evaluating student performance. Shannon and Boll (1996) demonstrated that increasing numbers of teacher education programs are using portfolios to document preservice teachers' experiences and attainment of competencies. The traditional portfolio, of maintaining and presenting information in a hard-copy format, yielded problems in the distance-learning program. Students would have to absorb the cost of shipping the final product to faculty. There could be delays in delivery of the materials. If professors recommended changes in the portfolios, the process of shipping and receiving would have to be repeated, creating more delays.

The development of an online portfolio solved many of these problems. Students were authentically assessed on their learning, shipping and response delays were eliminated, and faculty and students had instant, continuous, and free access to the portfolios. Since the degree had a concentration in Educational Technology, the actual development and maintenance of the online portfolios were a demonstration of student knowledge and ability.

What are Portfolios and Why Use Them?

According to Collins (1990), portfolios consisted of real-world performance products that could be used to assess students. Portfolio assessment is an authentic way to measure student knowledge. The portfolio

is a collection of student work that demonstrates knowledge and skills gained throughout the program. Portfolios have included student papers, video tapes of the students' applying skills and knowledge, photographs of works completed, floppy disks containing copies of computer-based work, learning logs, and other items that students felt adequately represented the knowledge gained throughout the program. Portfolios have gained support in the educational community during the past decade (Koretz, 1998).

State requirements for successful completion of a Master's Degree in Florida include comprehensive written or oral examinations or a capstone project. To meet state graduation requirements, the portfolios would have to act as an equal alternative to comprehensive examinations. These exams traditionally measured students' abilities to synthesize and apply the knowledge they had gained in their coursework. Meadows and Dyal (1998) concluded that the traditional comprehensive exams provide only a cursory glimpse of the students' knowledge and do not adequately address the students' skills and practical experiences. Jonassen (1996) argued that examinations are stressful for the student and make the evaluation process artificial by limiting the supports and resources of real-life situations.

Students in the program expressed a desire to prepare a professional portfolio to more accurately demonstrate the knowledge attained during the program. To be an adequate substitute for the comprehensive exam, the portfolios needed to show students' application of skills and knowledge, as well as their synthesis of major themes of the Master's Degree. Barton and Collins (1993) stated that a portfolio not only allows students to take ownership of learning, but also provides them with the opportunity to demonstrate their ability to address the professional duties and experiences they will encounter. Additionally the experience of developing a portfolio will give educators practice in portfolio development to allow them to model the skills and knowledge to students they will be teaching. Barton and Collins (1993) argued that the implementation of portfolios shifts the entire educational process from a teacher as giver of knowledge to student as seeker of knowledge.

Portfolios are being widely used in elementary and secondary schools as an authentic assessment of student learning. Additionally, many school districts are requiring teachers to create annual portfolios to demonstrate professional development. The use of portfolio assessment at the graduate level seemed a logical progression of what research has proven to be good practice at other levels. As students and faculty discussed the portfolio project, a diverse understanding of portfolios became apparent. Students and faculty viewed portfolios as works in progress, showcase pieces, and as resumes or curriculum vitae. Danielson and Abrutyn (1997) described many different types of portfolios, including assessment, best works, employment, and admissions. Faculty concluded that portfolios could be developed to address all the needs of the students and still meet state requirements for graduation. Faculty and students agreed that the portfolio project would need to demonstrate their pedagogical knowledge as well as their technology skills. Students in the Educational Technology program would have taken many of their courses in computer applications and implementation. These types of projects would need to be included in a portfolio demonstrating the students' knowledge. The collection of work in the students' portfolios would serve as a representation of their knowledge, and as a resume for future professional endeavors.

Developing Portfolios Online

A shift away from the learning process as an accumulation of knowledge toward learning as the application of skills has increased the acceptance of portfolio assessment (Simonson, Smaldino, Albright, & Zvacek, 2000). The traditional portfolio format consisted of collecting and maintaining artifacts that demonstrated student knowledge and its application and synthesis in real-life situations. The artifacts could include papers, pictures of projects implemented, floppy disks of computer-based work, video tapes of the actual application of knowledge and skills, learning logs, and any other media that represented student growth (Jonassen, 1996).

Students enrolled in the Educational Technology Online (ETOL) program completed both educational foundations and computer courses. Students were required to write papers, explore various software packages, learn a programming language, and work with computer hardware. Included in a traditional portfolio would be hard copies of the papers, printouts of software as applied to the classroom, floppy disks of programs written, and pictures or videos of work with computer hardware.

Obviously, work from twelve courses could amount to a large collection of artifacts. Traditionally, the portfolio would be contained in a binder, file box, or other storage method conducive to logical organization. There were several drawbacks to this traditional format that did not meet the needs of the distance-learning students. The first issue was that students would have to incur the cost of shipping the completed work to FGCU near the completion of their coursework. Additionally, shipping can be time-consuming and the portfolio could be lost in the process. Once faculty received the portfolios, suggestions and comments could be emailed, but students may wish to recompile the artifacts in their portfolios. This process would involve the shipping the portfolio twice, increasing the costs and likelihood that materials could be damaged or lost in the process. Unless students were to ship their portfolios throughout their program, faculty would not have an ongoing assessment of student growth.

The M.Ed. has a concentration in Educational Technology. It was assumed that students would have the ability to create an electronic version of the portfolio. Other universities have employed CD-ROM's as the storage device for the portfolio (Li, 1999). In addition to CD-ROM's, Zip disks allow students to compile large amounts of information in a single location. The traditional artifacts could easily be formatted to be included on the CD or the Zip disk. Papers, learning logs, and digital pictures could be saved directly to the disk from the word processing software. Regular pictures could be scanned and included on the disk. Computer-based work, including computer programs written, would easily be saved in this manner as well. However, CD's and Zip disks still have to be shipped to faculty for evaluation. While shipping cost would be greatly reduced, feedback could be slow and students would need to resubmit the disk if any changes were made. Faculty would also not have continuous access to the portfolio to assess student growth. Additionally, students would need to ensure that the electronic information they had submitted was in a format that the faculty would be able to view on the university's computers. Students would need to save the artifacts in a format that is compatible with the faculty's software.

The logical step beyond the electronic portfolio was to implement an online portfolio. There are many advantages to this format with few disadvantages for the students. First, free web space is provided by the university for the duration of the student's enrollment. This eliminates the need for student's to purchase a CD burner or a Zip drive. Students have unlimited space and access to their website. They can update the portfolio at a time that is convenient for them. When students are ready to have faculty evaluate their websites, they simply email the URL to the professor. The professors can immediately examine and evaluate the portfolio. If feedback is given, the professor simply emails the student the comments. The need to ship disks or a completed portfolio is eliminated. The online portfolio is in HTML format, which eliminates the need for students to buy the same software as the university. HTML is the language of the Internet that can be read by any computer that has an Internet browser. Additionally, if students wish to share their portfolios with other students or faculty, they simply give them the URL of the web page. With permission, faculty can use the completed portfolios as models for new students and as a marketing tool for the ETOL program.

The drawbacks to online portfolios are mainly focused on student knowledge of web page design. If students had never designed a web page, the learning curve for beginning the page could be steep. However, one of the students' courses teaches web page design. Students use the latest web authoring software to make content-based web pages that will be implemented in their classrooms. This knowledge can be applied to the development of the online portfolio. Another drawback is that students would need to have access to either a digital camera or digital video camera, or have access to equipment such as scanners that convert traditional media to a digital format. This is necessary to make pictures and videos available through the Internet.

FGCU's Online Portfolio Process

The online Master's Degree offered at Florida Gulf Coast University presented a unique situation for students completing the program. The state mandates that students must pass comprehensive examinations or present a capstone project for successful completion of the degree. Students in the online program were located around the world and travel to the university was often time and cost prohibitive. As an alternative to comprehensive exams, the ETOL program implemented a policy requiring students to complete an online portfolio. In implementing this requirement, the faculty and students addressed several issues pertaining to the development of online portfolios.

Barry and Shannon (1997) recommend six strategies for successful portfolio implementation including, early communication of expectations, limiting the number of components, establishing criteria, teaching self-reflection and self-evaluation, providing adequate time for development, and providing training on the development. FGCU's portfolio implementation process closely followed these recommendations. Student input was a critical factor in the success of the online portfolios.

The first step in implementation included a discussion with the students currently enrolled in the program. Students and faculty recognized the potential of the online portfolios in addressing the desires of the faculty for a more authentic assessment of the students' learning. Students raised concerns regarding their ability to design of a website that would adhere to the standards of quality web publishing. Jonassen (1996) recommended developing a rubric that clearly states the desired outcomes of the portfolio. Students created a rubric based on HTML style guides, examination of existing web sites, and the need to present their knowledge in a portfolio-type web page. The rubric was a clear and early communication of the expectations for the online portfolio. The rubrics outlined criteria for content, navigation issues, and models of acceptable web site design.

In their websites, students were encouraged to compose a simple first page that gave personal and academic information. This introductory web page would contain links to pages for each of the student's courses. Each course page would contain material that students completed throughout the course, or projects that were a result of learning in that course. This provided a simple template for the web site layout. Students were offered flexibility and creativity in the remainder of the web site. Students could choose whatever work they felt best represented their knowledge. This allowed for self-reflection and self-evaluation of the work to be included on the web site. Additional self-reflection will occur as the students maintain the portfolio and communicate with faculty. Students were encouraged to use the rubric to self-assess their web site throughout its development. This was an excellent tool in guiding students in the creation a professional web site.

Information on the portfolio requirement is provided to students when they begin the program. This allows the student several semesters to compile the portfolio material and design the web site. A course in web page design is included in the ETOL program. This course included learning the most recent web page design software. This would allow students to gain the knowledge necessary to complete the online portfolio. Students were taught how to use FTP software to transfer their files to the university's server. Faculty taught students how to create subdirectories to organize their website and allow for other websites on the university-provided web space. Students were required to begin their portfolios in this course. Several other courses required students to update the portfolio and provide a log of the updates to the professor.

Students in the ETOL program were encouraged to share their portfolios with classmates. Faculty could use specific examples of student work to exemplify best practices. Students included digital video, pictures, papers, projects, and computer programs in their online portfolios. Student feedback indicated that the initial planning and development of the online portfolio was time intensive. Students felt that they had put a great deal of thought and planning into the development of the general outline of the web site. In most cases the extensive planning paid off, as students were able to easily and quickly update their portfolios as they completed projects in their courses. Students appreciated the authentic nature of portfolio assessment to the traditional comprehensive examinations.

Another benefit of the online portfolio is that students were esentially guaranteed a back-up copy of their portfolio. As students composed their portfolios on their home computers, they would be saving the web site on their hard drive. As students uploaded their website to the university's server, that created an additional copy of the portfolio. The university's server is backed up nightly, so any catastrophic losses would only be information uploaded in the previous 24 hours. This gave students the assurance that they would have a copy of their portfolios in two places if computer failure caused the loss of files on either end.

Faculty response to the online portfolios was equally positive. They appreciated the fact that they could check student progress in all of their courses throughout the student's enrollment. Faculty could make suggestions for improvement at any time to help guide students in a direction acceptable at the Master's Degree level. Faculty shared the online portfolios with prospective students and with other faculty at the university.

Conclusion

As distance learning opportunities expand, faculty and students need to address and adapt to the changing educational environment. Students enrolled in a degree program that is offered entirely online encounter a unique situation for assessment of learning. They may never step foot on the campus, some not even for graduation. This circumstance led faculty at FGCU to explore options to the traditional comprehensive examinations administered at the culmination of graduate work. Research supports the use of portfolios as an authentic assessment of student knowledge and skills. Many researchers prefer the real-life application of the portfolio as opposed to artificial nature of comprehensive examinations.

Faculty and students in the Educational Technology program agreed that an electronic portfolio would best represent their educational and technology knowledge gained throughout the program. Students were relieved of the pressures of comprehensive examinations. The online format allowed students to continually update and revise their portfolios. Faculty could monitor student progress and provide feedback throughout the program. Students and faculty communicated about the portfolios using email, chat rooms, and the telephone.

The initial learning curve of web page design and uploading the site to the remote server was addressed in one of the required courses. Faculty required portfolio updates throughout much of the coursework, preventing students from procrastinating on the project until their final semester. Students were able to self-assess their work through the use of the portfolio web page design rubric. By choosing the material to be included in the portfolio, students were able to reflect on their learning and growth.

The online portfolios provided benefits in addition to an authentic, real-world assessment of student knowledge. Students used the portfolios as resumes when they began looking for technology jobs. The portfolios were an excellent demonstration of students' technology skills. They were easily accessible and simultaneously available through the Internet to many potential employers. Faculty used completed portfolios as models of best practices and to market the program to future students. These professional and impressive web sites are an excellent selling point, demonstrating the technology skills that students mastered upon completion of the program. The ETOL program at FGCU will continue to employ the online portfolios as a reliable and valid measure of student knowledge and skills.

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The Impact of Electronic Portfolios on Early Experience Preservice Elementary Teachers in Integrating Technology into their Instructional Process

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Abstract: This paper outlines the process for preservice students within Idaho State University's College of Education to meet mandated technology certification requirements. The College of Education has created a portfolio assessment process as a method for fulfilling this requirement. The resultant Instructional Technology course (EDUC3111) is constructed around the portfolio process. Evidence comprising the portfolio include tool software integration, educational software evaluation, and foundational standards regarding adaptations for special needs, basic computer/technical concepts and operation, equitable, ethical and legal use of technology, and the application of technology into instructional planning and delivery.

During academic year 1999-2000, there were 291 preservice elementary teachers enrolled in the fall semester and 124 enrolled in the spring semester. Each student submitted an electronic portfolio for assessment by the ITPA (Idaho Technology Portfolio Assessment) assessors. The students, during the fall semester, had a 97.6% success rate, and those in the second (spring) semester, 95.2%.

Introduction

Portfolio assessment has been used from elementary through graduate educational environments. While standardized testing measures can provide a picture of a student on a particular day, at a particular time, portfolios offer the opportunity to capture the student over time. Since this type of authentic assessment is a collection of "purposeful" work (Gilman, Andrews, & Rafferty, 1995; Jardine, 1995; Benoit & Yang, 1996), the assessor can view a continuum of products reflected in the portfolio contents.

A number of researchers (Wesson & King, 1996; Rothman, 1996; Tierney, 1992) believe portfolios allow students to be active participants in their learning and growth, increase self-discovery, and aid in reflection about their accomplishments, and knowledge acquired. For preservice education majors, the opportunity to document the integration of technology into a variety of classroom settings and subject areas, allows the students to reflect on characteristics of the learner, the best use of technology to address unique learning styles, and the points at which these electronic teaching/learning aids should be employed.

This belief in the role of portfolio assessment, coupled with the need to provide technology certification for our undergraduate education students, resulted in the creation of an Instructional Technology course (EDUC311). During this course, students build portfolios, including two student work

samples from their teaching experience in the corequisite course, Planning, Delivery, and Assessment (EDUC309), a required early field experience.

The Electronic Portfolio Development

Idaho's State Legislature has mandated the integration of technology into the PK-12 classrooms. In response to this, the Idaho State University College of Education created a portfolio assessment process for practicing, certificated personnel in the schools as well as preservice students within its teacher education program.

A group of practicing educators and College of Education faculty produced a rubric for assessment and then benchmarked this in anticipation of the first series of portfolios for review. The schools undertook the task of preparing their teachers through a series of portfolio development workshops. In addition, the College of Education's Technology Outreach Unit also trained teachers in various school districts in portfolio development.

The training and support provided for teachers in developing the portfolios was beneficial and led to a concentration on the use of portfolios to document preservice teacher integration of technology. In the beginning, the course was a required core class for all education majors. While this first effort was important, the connection to the student's field experience was missing. As a result, the College created a corequisite course with the portfolio class. When this occurred, there were changes in the undergraduate technology course to better address the needs of its new corequisite. The joining of the two courses also helped provide an experiential grounding for the contents of the electronic portfolio in that these activities would be tied to a formalized classroom setting.

EDUC311 (Instructional Technology) and its partner course, EDUC309 (Planning, Delivery and Assessment) have concentrated their efforts in supporting the students as they move toward their first field experience and the development of the electronic portfolio. Cooperating teacher classrooms for this "electronic" field experience are selected with two major factors in mind: Identification of master teachers who can model best practices in instructional delivery, and classrooms where technology is accessible either within the self-contained room or through outside resources, such as the library/media center and/or computer laboratory.

The Problem

The goal was to align EDUC311, Instructional Technology, with EDUC309, Planning, Delivery, and Assessment, to form a cohesive reinforcement of practices expected by third year education majors during their first field experience. From the EDUC311 course perspective, the goal was to merge technology integration methodology and experience into the student's early field experience of planning, delivery, and assessment of instruction. A secondary purpose was to supervise students in the creation of electronic portfolios that could be successfully assessed by the Idaho Technology Portfolio Assessment Panel.

Methodology

Even though Idaho State University has in place a prerequisite computer course that all students must take before granted admittance into the College of Education, students arrive in the EDUC311, Instructional Technology, class with gaps in their technology understanding and skills. They also have little concrete information relating to the alignment between the Instructional Technology class and their EDUC309 corequisite. The first few class sessions, then, demonstrate what a technology portfolio is — the contents, the template used, the flexibility built into it— followed by a correlation between the two corequisite classes (EDUC311 and EDUC309). Students are also provided copies of the Idaho Technology Portfolio Guidelines.

The assessment process used by ITPA (Idaho Technology Portfolio Assessment) in evaluating certificated educators and preservice candidates is also the same. It is important to let the EDUC311 students know they will be judged equally with their cooperating teachers and other professionals in the field. Doing this reinforces the "fairness" of the assessment process and helps them see themselves as beginning professionals.

The Instructional Technology course is constructed around the integration of tool software, educational software, and ISTE (International Society of Technology in Education) foundational standards regarding adaptations for special needs, basic computer and technical concepts and operation, equitable, ethical and legal use of technology, and the application of technology into instruction.

Students enrolled in the EDUC311 course are provided a template for their electronic portfolio (see Figure 1). This is a Web-based umbrella with the various forms (cover sheet, release affidavit, student permission form, matrix of standards, software evaluation form, and troubleshooting affidavit) created and ready for student information and completion, as well as a series of menus and submenus and hyperlinks.

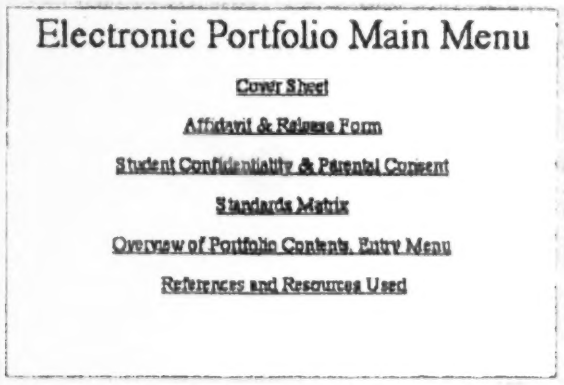

Figure 1: These are the major elements contained within the electronic portfolio. All items shown are templates already created and ready for the students to individualize as appropriate for their portfolio contents.

The bulk of the Instructional Technology course is centered on learning integration tactics for technology within the lessons they are developing in the EDUC309, Planning, Delivery, and Assessment, class. Students are asked to identify their instructional setting for EDUC309 placement — student demographics and profiles, subject area to be taught, grade level, access to technology in support of their teaching, etc. Once this is established, all the student's activities within EDUC311 are created through this focus. Thus, the degree and type of integration activities, the adaptations for students with special needs (e.g., physical, cognitive, and behavioral), equitable access to technology for all targeted students, and methods for outreach to families are dictated by their information about the cooperating teacher's classroom.

There are eight required entries in the Electronic Portfolio (see Figure 2). Evidence of tool integration in word processing, databases, spreadsheets, electronic presentations, telecommunications, software evaluation techniques, troubleshooting, and technology integrated student work samples to support student-centered teaching approaches. Entries 1 through 6 require learning activity plans to support the integration strategies. As much as possible, it is expected that the integration activities will be student centered.

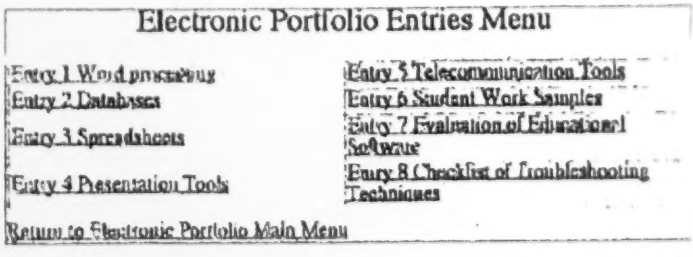
Electronic Portfolio Entries Menu
Entry 1 Word processing
Entry 2 Databases
Entry 3 Spreadsheets
Entry 4 Presentation Tools
Entry 5 Telecommunication Tools
Entry 6 Student Work Samples
Entry 7 Evaluation of Educational Software
Entry 8 Checklist of Troubleshooting Techniques
Return to Electronic Portfolio Main Menu

Figure 2: This is an example of the Portfolio Entries Menu where the learning activity plans and evidence of products are placed.

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Within the learning activity plans, evidence must be shown for adaptations, outreach to families, and clear assessment plans paired with the listed achievement targets. Any products (e.g., spreadsheets, charts, databases, handouts, scoring rubrics, etc.) must be included with the learning activity plans. Figure 3 presents an example of a submenu. This student included an example of a product (spreadsheet chart example) that directly relates to the learning activity plan. The other item, Gradebook, demonstrates the use of a spreadsheet for management in teaching.

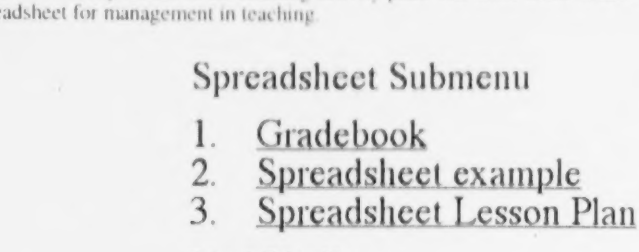

Figure 3: Example submenu for Entry 3, Spreadsheets.

Students are also required to embed appropriate hypertext links for navigational purposes. In the example in Figure 3, Gradebook, Spreadsheet example, and Spreadsheet Lesson Plan are hypertext links and will lead the assessor to the pages in the portfolio pertaining to each. There is also a hypertext link for returning to the Entries Menu. To further support navigational ease, links are embedded into each of the item (Gradebook, Spreadsheet example, Spreadsheet Lesson Plan) pages for returning to this submenu.

Navigational ease is important for the student, as well as the individual perusing the portfolio. Links and overall structure of the electronic portfolio are considered in the evaluation of the portfolio in the EDUC311 class; however, ITPA (Idaho Technology Portfolio Assessment) assessors only consider the contents of the portfolio as it relates to evidence of expertise in technology integration within the teaching/learning environment. The assessment panel members consider the hypertext links as "conveniences" for them in examining the contents. Should links not work, the assessment members have access to the student's original files, which have been placed in appropriate folders within the electronic portfolio's file structure. Thus, in the worst case scenario, a student can still be successfully evaluated for their ability to use technology in learning activities through the original files.

Results

During the first year (AY 1999-2000) of the pairing of the two courses (EDUC311 and EDUC309), there were 291 preservice elementary teachers enrolled in the fall semester and 124 enrolled in the spring semester. Each of these students submitted their electronic portfolio for assessment by the ITPA (Idaho Technology Portfolio Assessment) assessors. The students, during the fall semester, had a 97.6% success rate, and those in the second (spring) semester, 95.2%. These percentages are significantly higher than inservice teacher populations assessed during the same time periods.

Furthermore, an examination of the technology integrated lessons created and taught by the spring semester students in their EDUC309 field experience displayed a measurable improvement from those submitted the first (fall) semester.

Discussion

The current status of the EDUC311, Instructional Technology, course is one of revision and growth. The alignment of the two corequisite courses continues with plans for greater collaboration and coordination among all instructors for the two offerings. However, even at this early stage of the development process, it appears the process of developing learning activity plans that include technology integration, coupled with the requirement for a minimum of two lessons being taught during the early field

experience, has resulted in a heightened awareness of technology in education. Students are also learning ways to adapt to accommodate the use of technology in instruction.

The College of Education is also embarking on a path of portfolio development beyond that included in EDUC311. Students will be encouraged to develop an "entrance" portfolio, consisting of lower level entries, such as philosophy of teaching, diversity statements, and beginning case studies. The EDUC311 entry will, of course, be the electronic portfolio of integrated lessons, software evaluation, and other elements required for State certification. Beyond this, plans are being made to expand the portfolio concept to include an "exit" section. This would allow students to document their student teaching internship experience, including adding or replacing lessons already created in the electronic portfolio entries, video teaching samples, and greater inclusion of student work and assessment techniques. Eventually, the College hopes to move toward a totally electronic portfolio presence, where students would receive help in placing their "entrance" entries into a digitized format, followed by a full technology assessment portfolio piece (the "development" portion of the educational experience), and, finally, the "exit" pieces gathered during student teaching. The direction for this development aid is not clear at this time. Possibilities include expanding the student teaching internship seminar course to include portfolio refinement, and/or workshops offered periodically throughout the student's tenure within the College of Education. In either scenario, help would be provided for placing entries into the electronic portfolio, creating and editing images for placement (e.g., digital still and digital video camera material, as well as repurposing VHS video), and refinement of the portfolio to become a professional "snapshot" of the student's capabilities.

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Making the Case for Science Teacher Learning: An Analysis of Argument and Evidence in Electronic Portfolios

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Abstract: This interpretive case study explores the nature of prospective elementary teachers' evidence-based philosophy statements for science teaching and learning, as portrayed in web-based science teaching portfolios. Evidence-based philosophy statements are explicit articulations of beliefs related to learning and teaching science. The 32 participants authored the portfolios in a web-based environment, allowing them to connect claims in their philosophies with evidence from their work as teachers. In addition to the electronic portfolios, exit interview transcripts were inductively analyzed. Based on the data, the claims in the prospective elementary teachers' philosophies became more science-specific and learner-sensitive over time. Supporting evidence was increasingly drawn from classroom-based experiences, requiring connections among theory and practice. In addition, there was evidence that the technology facilitated substantive reflection by (a) providing a simple means of making explicit connections between evidence and claims; (b) allowing prospective teachers to express themselves creatively without diminishing an emphasis on substance; and (c) providing a means of saving multiple versions (track changes over time).

Underpinnings, Objectives and Significance

Research on teacher development suggests that opportunities to reflect critically on practice can play an important role in learning to teach (Abell and Bryan, 1997; Glickman, 1990; LaBoskey, 1994; Russell and Munby, 1992). Teachers typically do not characterize their work as having a theoretical basis (Sergiovanni & Starratt, 1993). Rather, teachers describe their practice, offer hunches about "what works," and generate principles about teaching and learning from their perceptions of effective practice. It is impossible to effectively engage in the act of teaching without a framework or educational platform (Walker, 1971) -- to guide learning and teaching decisions. Yet, for prospective teachers, the platform is often implicit and contains a web of beliefs, values and propositions that are not necessarily internally consistent.

There is a great deal of evidence that suggests it is difficult to move preservice teachers beyond focusing on surface level features of classroom instruction to more critically reflective practices that can illuminate and refine their platform for learning and teaching (Borko, Livingston, McCaleb and Mauro, 1988; Calderhead, 1989; Feiman-Nemser and Buchmann, 1987; Gore and Zeichner, 1991; Weinstein, 1990). Calderhead (1989), for example, notes that student teachers have a tendency to avoid opportunities to reflect critically on their practice. He attributed this to several factors, including prospective teachers' emphasis on their own performance, their high level of ego, and their lack of analytical skills and language, all of which are necessary to evaluate their own teaching. Calderhead suggests that teacher educators provide scaffolded tasks of a nature and level such that prospective teachers can perform them, as well as learn from them.

Several teacher educators have proposed such approaches for assisting prospective teachers in critically analyzing and evaluating the teaching decisions they make (Abell and Bryan, 1997; Gore and Zeichner, 1991; Johnston, 1992; Zulich, Bean and Herrick, 1992). For instance, Gore and Zeichner (1991) attempted to use action research as a means of encouraging critical reflection among preservice teachers. Although their analysis of 18 student teacher action research projects indicated that this strategy has only limited success, the authors still support it as a way of structuring reflections. They assert that "it does not make much sense to seek to promote or assess reflective practice in general without establishing clear priorities for reflection." Others agree, pointing out that the key to success in terms of developing more critical reflective practice seems to rest in whether reflections are guided (Zulich et al., 1992).

Portfolios have gained fairly wide acceptance in teacher education in recent years. Dana and Tippins (1998) point out that the broad definition of portfolios in teacher education - a "collection of evidence" that demonstrates some aspect of teachers' knowledge, skills or dispositions - does not necessarily allow for opportunities to engage prospective teachers in meaningful reflection. For example, the following descriptions of teaching portfolios exemplify models that lack reflection: teaching portfolio as scrapbook, portfolio as overflowing container, and the extended resume (K.Wolf as cited in Dana and Tippins, 1998). Dana and Tippins go on to propose a model for science teaching portfolios that is firmly grounded in the literature on reflective practice and constructivism. They describe science teaching portfolios as "spaces where prospective teachers represent their unique constructions of what it means to teach science in ways which permit them to analyze, discuss and evaluate their own teaching practices and professional growth" (p.722).

Therefore, the research reported in this paper explores the nature of prospective elementary teachers' science teaching philosophies, as portrayed in web-based science teaching portfolios. More specifically, the research questions framing this study include: (1) How do prospective teachers describe and support their educational philosophies for science teaching and learning? and (2) What are the central claims of the philosophies and how do they relate to contemporary science education reform ideals?

Participants and Context

The electronic portfolios described in this study were developed by 32 prospective teachers as part of the course, Teaching Science in Elementary Schools. These prospective teachers were participating in an innovative, research-based, year-long internship program that is part of a professional development school partnership between the university and local school district. The course for which the portfolios were developed is one of four methods courses taken during the first half of the internship year. These courses are complemented by an intensive field experience.

Prospective teachers' web-based portfolios were developed throughout the course and included 2 main components: (1) a collection of evidence and (2) an evidence-based philosophy for science teaching and learning. All course assignments were submitted via web-based portfolios and included in the collection of evidence area. Three versions of the web-based philosophy for science teaching and learning were developed. The standard format for philosophy statements was a series of claims about science teaching and learning supported by multiple pieces of evidence (from collection of evidence). Each piece of evidence was then justified in light of the claim that was being made. Prospective teachers' initial versions were developed early in the course and revisited in light of new experiences and learning.

Research Methods

This interpretive case study of the nature of prospective elementary teachers' espoused science teaching philosophies, as portrayed in web-based science teaching portfolios, was done within the research traditions of phenomenological inquiry and grounded theory. Multiple data sources were employed to understand the nature of the espoused philosophies and to provide a way of triangulating findings across data types (Lincoln & Guba, 1985). The primary source of data was 32 prospective teachers' electronic portfolios. Three versions of each portfolio were collected across the semester. A secondary data source was transcripts of exit interviews with prospective teachers.

Inductive analysis was used to construct themes from the data set (Bogdan & Biklen, 1992; Merriam, 1988). All portfolios and transcripts were repeatedly examined to allow emergent patterns to surface (Lincoln & Guba, 1985). Multiple readings through the electronic portfolios and transcripts enabled the researchers to construct themes from the participants' words, which were recorded in margin notations (Miles & Huberman, 1994; Strauss & Corbin, 1990). A qualitative data analysis computer program facilitated the data reduction and analysis process. Developing assertions were tested by seeking both confirming and disconfirming evidence from the data set (Patton, 1990). Differences in the understandings of the researchers were resolved through negotiation until a point of consensus was reached.

Findings & Discussion

Early iterations of the prospective teachers' espoused philosophy statements were vague and not particular to science teaching and learning. Common claims included statements like, "Science learning should be engaging and enjoyable." Another common statement was, "Science learning should be hands-on." Evidence used to support these claims was primarily drawn from personal K-14 learning experiences. Other common sources of evidence included early course readings and learning experiences. Justification tended to be descriptive rather than evaluative. That is, few prospective teachers were able to provide rationales that demonstrated how specific evidence was used to support a particular claim.

Several improvements were noted in the second and third versions of prospective teachers' espoused philosophies. First, claims were more specific to science teaching and learning and reflected ideas consistent with contemporary reform in science education (NRC, 1996). For example, many prospective teachers identified the importance of having children design science investigations, collect data, and develop explanations grounded in those data. Second, a number of claims reflected cognitive considerations associated with learning for meaningful understanding. For example, claims of this type identified the importance of children's prior knowledge and alternative conceptions and the central role they play in developing appropriate and powerful learning opportunities.

Evidence for claims made in the later versions of the philosophies relied more heavily on field-based assignments. However, science-specific claims tended to receive support from learning activities used in the methods course. Finally, justification improved greatly in the later versions. With support and feedback from the course instructor and peers, prospective teachers were able to move beyond generating superficial connections to crafting more substantial relationships between evidence and claims.

During exit interviews, prospective teachers were asked to describe the "value-added" of developing web-based portfolios as opposed to more traditional paper portfolios. Most responded that their skills and confidence for using applications of technology had improved. They felt that this would make them more marketable as teachers. Some of the prospective teachers were able to articulate their ideas about "value-added" in terms of their own thinking and learning. These prospective teachers explained that creating an evidence-based philosophy supported them in making connections among course activities/readings and field-based experiences. The electronic format was described as helping them make explicit connections among claims and evidence easily. In addition, they acknowledged the value in being able to examine earlier versions of their philosophies and reflect on how their thinking had changed over time. Several commented that the electronic version allowed them to be creative and thoughtful without spending significant amounts of time on superficial "cutting and pasting" tasks.

In closing it is important to emphasize that the findings of this study are encouraging in light of the literature on prospective teachers' reflective practices. The findings suggest that developing several versions of an evidence-based philosophy statement may support prospective teachers in engaging in thoughtful reflection. More specifically, as prospective teachers are encouraged to re-evaluate their thinking in light of new experiences and learning, they are supported in making connections between theory and practice. In addition, there is evidence that the technology used facilitates substantive reflection by (a) providing a simple means of making explicit connections between evidence and claims; (b) allowing prospective teachers to express themselves creatively without diminishing an emphasis on substance; and (c) providing a means of saving multiple iterations that document changes over time. Given the important role of reflection in learning to teach, this study warrants additional research on the development electronic, evidence-based philosophies.

A Pilot Project: Integrating Multimedia Portfolio Development Into The Preservice Teacher Education at Randolph-Macon College

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Abstract: Randolph-Macon College offers teacher education as a minor program. To fulfill the requirements for teacher education, and to comply with the state regulations, instructional technology has not been taught as a course. Instead, it is integrated into Foundations of Curriculum and Instruction, Educational Psychology, and the capstone course Senior Seminar. Although this method has been relatively successful, preservice teachers request more opportunities be provided for learning new technology skills and applying them to teaching and other professional use. Research findings indicate that creating multimedia portfolio greatly enriches preservice teachers' technology experience. In this pilot project, four volunteer preservice teachers learn and use various instructional technology skills for the development of their electronic portfolios. The results of the study will impact the redesign of the Education Senior Seminar course.

Preservice teachers must be prepared to apply various computer skills for teaching and information management. They are expected to use advanced technology for classroom instruction and presentation. It has become a trend to introduce preservice teachers to the development of multimedia and web sites (Read & Cafolla 1999).

The preservice teachers at Randolph-Macon College attend technology workshops as part of the requirements of the Education Minor program. They learn the basics of educational media and technology at the Foundations of Curriculum and Instruction course. For the Educational Psychology course, preservice teachers learn how to create spreadsheet and databases, and analyze the information for their research paper. They also evaluate computer-based instruction and the resources found on the World Wide Web. In their senior year, the preservice teachers attend the capstone course, Senior Seminar, of which one-third of the class-time is dedicated to incorporating technology into the development of an integrated instructional unit, and publishing the unit on the World Wide Web. The instructional unit will then be used for their student teaching.

Feedback on this technology training curriculum has been positive. The preservice teachers all agreed that the Senior Seminar technology module was especially helpful, where they are encouraged to learn new technology skills and use them in their lesson plans. They also commented that they would welcome more opportunities to create multimedia-assisted presentations, including electronic portfolios.

Portfolio development is a requirement for the Randolph-Macon College preservice teachers. They update their personal portfolios throughout their study in the program, and by the time of student teaching, make the portfolios available for prospective employers to review. The format of their portfolios has been mainly limited to print and artifacts.

The pilot project is intended to encourage preservice teachers to begin to learn and use the advanced instructional technology at an early stage at the teacher education program. The objectives are: first, to enrich the preservice teachers' experience with educational media and technology; secondly, to enhance their evaluation and presentation of their professional growth; thirdly, to assist the participating preservice teachers in the development of quality portfolios using multimedia and the World Wide Web (Milman 1999); fourthly, to investigate the process and effectiveness of multimedia portfolio development. And lastly, based on the

results of the pilot study, to evaluate the current curriculum of the capstone course and make possible changes to the Senior Seminar.

Four sophomore students from the Foundations class have volunteered to participate in the pilot project. At present they focus on studying portfolio models, and learning how to create quality sound and video recordings. They are also working on putting their philosophies for teaching and mini-lesson plans in PDF format and starting a Web site for the portfolio. They will videotape their final presentations for the course, and convert the videos to digital format. They will learn other advanced techniques as they progress with their study in the teacher education program. The techniques will include computer graphic processing, locating multimedia and web-based demonstration teaching materials, and creating digital sound and videos for the Web site.

For the on-going formative assessment of this pilot project, the student teachers keep journals of the development process, and monitor the time demanded for the project. The teacher educators help them examine the content of the portfolio. The instructional designer evaluates whether and how well the process promotes the student teachers' technology proficiency, and help to meet the *Technology Standards for Instructional Personnel* (1998). The instructional designer also identifies the costs and resource needed for the current project, and the financial implications of electronic portfolios development for all R-MC preservice teachers. The summative assessment will be conducted toward the end of the four preservice teachers' senior year. The participating student teachers will be interviewed. The process, the final products, and the participants' technology skills will be evaluated by the teacher educators, the cooperation teachers, the instructional designer, and possibly their prospective employers. The results of the assessment will be used for the redesign of the capstone course, Senior Seminar, at Randolph-Macon College.

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